A FRAMEWORK FOR THE INTEGRATION OF INFORMATION TECHNOLOGY IN THE EDUCATION OF PROFESSIONAL ACCOUNTANTS AT SOUTH AFRICAN UNIVERSITIES

BY

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DECLARATION

I, the undersigned, hereby declare that the work contained in this dissertation is my own original work and that I have not previously in its entirety or in part submitted it at any university for a degree.

Signature: _____ Date:_____

ABSTRACT

The accountancy profession operates within an environment that is changing at a rapid pace. It is the responsibility of the profession to ensure that all its members (including future members) meet the expectations placed on them by the users of their services. Professional accountants need to stay relevant in this changing environment that may require them to change or adapt the services they offer to their clients. It is the responsibility of professional accountancy bodies to strategically plan for these changes to ensure that members that join the profession posses the required knowledge and skills to be relevant and to stay relevant within the environment they operate in.

One of the key drivers of change in the environment has been identified as the advances in information and communication technologies. Information and communication technologies have an impact on the role that accountants play in the environment (i.e. what they do) as well as on how they perform their role (i.e. how they do it). The main aim of this research was to determine if, and to what extent, students, that have completed their formal education and enter the profession as trainee accountants, possess the knowledge and skills to enable them to interact with and use information technology to be regarded as competent accountants within the South African business environment. Accountants are educated in South Africa at universities that offer programmes that have been accredited by a professional accountancy body as well as through practical training offered by training organisations. During this education process, accountants are imparted with the knowledge and skills as prescribed by the professional accountancy body so that they can join the profession as competent accountants.

This research showed that there are serious shortcomings in the formal education of students regarding information technology that results in students entering the profession as trainee accountants not being competent in using information technology. The reasons for students not being competent in information technology are:

- the lack of clear guidance on the IT skills required of students completing their formal education because of professional accountancy bodies setting IT syllabi that are too vague and/or concise;
- ignorance of the demands on trainee accountants as to the IT skills they require to be competent in the South African business environment; and
- the lack of proper IT training offered by South African universities that deliver trainee accountants that possess a limited range of IT skills that may not be relevant to the environment students will function in.

Through a survey the perceptions of role-players at South African universities on the strategies that universities would have to employ to ensure that the students they deliver to profession, acquire the relevant IT skills to be competent in the use of information technology, were determined.

EKSERP

Die rekeningkundige professie funksioneer in ‘n omgewing wat deurlopend verander. Dit is die verantwoordelikheid van die professie om toe te sien dat al die lede (insluitend voornemende lede) voldoen aan die verwagtinge wat op hulle geplaas word deur gebruikers van hulle dienste. Dit mag nodig wees dat professionele rekenmeesters die dienste wat hulle aan kliënte lewer, verander of aanpas, ten einde relevant te bly in hierdie veranderende omgewing. Die professionele rekeningkundige liggame is verantwoordelik om vir hierdie veranderinge op ‘n strategiese wyse te beplan ten einde te verseker dat lede wat by die professie aansluit oor die nodige kennis en vaardighede beskik ten einde relevant te wees binne die omgewing waarbinne hulle funksioneer.

Een van die belangrikste drywers van verandering in die omgewing is die vooruitgang in inligting- en kommunikasie-tegnologië. Inligting- en kommunikasie-tegnologië impak op die rol wat rekenmeesters speel in die omgewing (m.a.w. wat hulle doen) asook op die wyse waarop hierdie funksies verrig wat (m.a.w. hoe hulle dit doen). Die hoofdoelwit van hierdie navorsing was om te bepaal of, en tot watter mate, studente wat hulle formele opleiding voltooi en tot die professie toetree as leerlingrekenmeesters, oor die nodige kennis en vaardighede beskik om inligtingstegnologie te kan gebruik ten einde as bevoegte rekenmeesters binne die Suid-Afrikaanse omgewing beskou kan word. In Suid-Afrika word rekenmeesters opgelei deur die formele opleiding by ‘n universiteit te voltooi wat geakkrediteer is by die rekeningkundige liggaam, sowel as praktiese opleiding wat ondergaan word by opleidingsinstansies. Gedurende hierdie opleidingsproses verkry rekenmeesters die kennis en vaardighede soos wat voorgeskryf word deur die professionele rekeningkundige liggaam ten einde toegelaat te word tot die professie as ‘n bevoegte rekenmeester.

Hierdie navorsing toon dat daar ernstige tekortkominge bestaan in die opleiding van studente ten opsigte van inligtingstegnologie wat tot gevolg het dat studente toetree tot die professie as leerlingrekenmeesters wat nie vaardig is in die gebruik van

inligtingstegnologie nie. Die redes vir hierdie tekortkominge kan toegeskryf word aan:

- die gebrek aan duidelike leiding oor die inligtingstegnologie vaardighede wat vereis word van studente wat hulle formele opleiding voltooi hoofsaaklik omrede die inligtingstegnologie-sillabus, wat deur professionele rekeningkundige liggame voorgeskryf word, baie vaag en bondig is;
- onkunde wat bestaan oor die vereistes wat gestel word aan leerling-rekenmeesters ten opsigte van die inligtingtegnologie-vaardighede wat van hulle verwag word ten einde bekwame rekenmeesters binne die Suid-Afrikaanse omgewing te wees; en
- die gebrek aan behoorlike inligtingtegnologie opleiding wat deur Suid-Afrikaanse universiteite gebied word wat veroorsaak dat leerlingrekenmeesters aan die professie gelewer word wat oor ‘n beperkte aantal vaardighede beskik wat nie noodwendig relevant is binne die omgewing waarbinne hulle funksioneer nie.

Deur middel van ‘n opname is die persepsies van rolspelers by Suid-Afrikaanse universiteite bekom oor hoe die relevante inligtingsvaardighede wat vereis word, binne die universiteite geïmplementeer kan word sodat rekenmeesters aan die professie gelewer word wat vaardig is in die gebruik van inligtingstegnologie.

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LIST OF ACRONYMS

AICPA	American Institute of Certified Public Accountants
CICA	Canadian Institute of Chartered Accountants
CIMA	Chartered Institute of Management Accountants
CPA	Instituted of Certified Public Accountants of South Africa
ICAA	Institute of Chartered Accountants in Australia
ICAEW	Institute of Chartered Accountants in England and Wales
ICANZ	Institute of Chartered Accountants of New Zealand
IFAC	International Federation of Accountants
IMA	Institute of Management Accountants
IT	Information Technology
PAAB	Public Accountant’s and Auditor’s Board
SAICA	South African Institute of Chartered Accountants

LIST OF KEY DEFINITIONS

Accountant refers to a member of a professional accountancy body (i.e. someone that has completed his/her education and training and has been accepted as a member of a professional accountancy body). (Can also be referred to as professional accountant or entry-level accountant.)

Competence can be described as the ability to perform a work role to a defined standard with reference to real working environments (IFAC Education Committee, 2003b:12).

Competencies refer to tasks performed in the workplace according to a defined standard (IFAC Education Committee, 2003b:12).

Capabilities refer to the professional knowledge, skills and professional values and attitudes required to demonstrate competence (IFAC Education Committee, 2003b:12).

Information technology encompasses hardware and software products (including communication hardware and software), information system operations and management processes, and the skills required to apply those products and processes to the task of information production and information system development, management and control (IFAC Education Committee, 2003a:5). Although the term *ICT* (information and communication technology) is often used as an alternative to *IT* (information technology), for the purpose of this research the term *IT* (information technology) will be used with the understanding that it includes the concept of communication technology.

Professional knowledge includes those topics that make up the subject of accountancy, as well as other business disciplines that, together, constitute the essential body of knowledge for professional accountants (IFAC, 2003b:21).

Professional skills include the various types of abilities required to apply professional knowledge and professional values and attitudes appropriately and effectively in a professional context (IFAC, 2003b:21).

Professional values, ethics and attitudes include the professional behaviour and characteristics that identify professional accountants as members of a profession and include principles of conduct (IFAC, 2003b:22).

Trainee accountant refers to someone who has completed his/her formal education and has commenced with his traineeship (practical training) at a training organisation.

Student refers to someone who is busy with his formal education at a university studying to become an accountant.

Chapter 1
Background and research design

1.1 Background

The reputation, relevance and value of the accountancy and auditing profession depend on the ability of its members to meet the expectations of various stakeholders and to provide a service appropriate to the needs of the particular environment in which they operate. One of the aims of the accountancy and auditing profession is to continually deliver accountants to the business environment that who are regarded as being competent (IFAC Education Committee, 2003b:8). Competence is the ability to perform a work role to a defined standard with reference to real working environments (IFAC Education Committee, 2003b:12). The work role refers to what the accountant is required to do, the defined standard refers to the level of work that is reasonably expected from accountants, and the working environment refers to the business environment that in which accountants function in. Professional bodies set qualification standards for the admission ofgranting membership to candidates into membership. As a result, employers and clients usually understand that such admission membership means that professional bodies are satisfied that their members are competent to work as professional accountants and to offer their services to the public.

A student that who wishes to qualify as a professional accountant needs has to join a professional body. The professional body will require that potential members to first acquire achieve the ‘defined standard’ through an education and training process. This process involves a period of formal education (typically offered by universities that have programmes that are accredited to a specific professional body) as well as a period of practical training (offered by training firms). The student must also satisfy the professional body that he/she will be able to function as a competent accountant within the specific business environment and will be subjected to assessments conducted by the professional body during certain stages of the education and training process.

Accountants operate within a specific business environment. This environment changes constantly and is continually creating making new demands onf the accountancy professionaccounting profession. These changes also create new employer expectations regarding accounting graduates' skills and abilities. To be competitive and add value in this changing environment, accountants need to acquire the knowledge and skills they require to be relevant. Professional bodies are responsible for setting qualification standards for the admission ofadmitting candidates as members. Hence, employers and clients trust that such admission means that professional bodies are satisfied that their members are competent to work as professional accountants and to offer their services to the public (IFAC Education Committee, 2003b:8).

Major changes in the environment in which professional accountants operate are challenging the current competencies displayed by accountants. The impact of information technology on the accountancy professionaccounting profession constitutes one of the major factors that affect this environment. Most companies and organisations use information technology to conduct business and to record and report on their financial and other activities. Accountants need to be competent in using information technology as they interact with it on a daily basis in performing their duties. To ensure that their future members are regarded as competent accountants, professional bodies need to determine the information technology knowledge and skills required by their members to be relevant and to remain relevant within the specific business environment in which they function.

In the next section the changes in the business environment will beare discussed to identify the effect it hasthey have on the competencies required of accountants.

1.2 The effect of the changing environment on the education of accountants

For many years, businesses relied on accountants to prepare financial information for internal and external decision making, to audit the fairness of the presentation of that information and to assist companies in complying with their regulatory and tax requirements. Because information was expensive and the preparation of accurate financial reports required the services of experts (such as professional accountants),

the emphasis was placedfell on rigorous technical accounting education and relevant experience in order to train these experts.

1.2.1 *Key drivers of change*

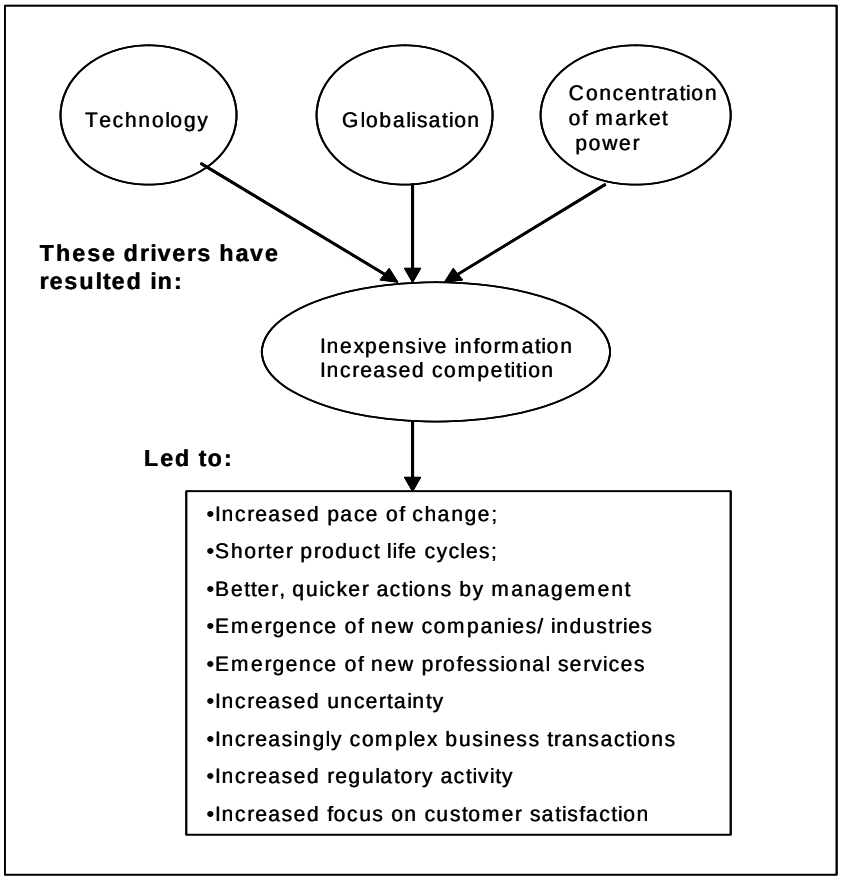
The business environment in which professional accountants operate has changed, mainly due to the rapid development of information technology, which has rendered the preparation and dissemination of information relatively inexpensive. However, Ssince information technology is only one of the forces that affect the work of professional accountants, it should not be viewed in isolation. It can be regarded as one of the key drivers that create these other forces. Researchers such as Boritz (1999) and Albrecht and Sack (2001) identified the following major trends that affect the accountancy professionaccounting profession:

- **Globalisation** has caused a growing interdependency interdependence among communities around the world, as well as a movement towards the harmonisation of practices, standards and professional qualifications (as became evident in the establishment of the International Federation of Accountants). There is also a growing desire for international reciprocity, where professional accountants who qualify in one jurisdiction are free to practise in another jurisdiction. This will obviously require all education and qualification programmes to be of more or less the same standard.
- The growth of international **capital markets** has led to an emphasis on finance in the accounting curriculum. This emphasis is evident not only in the teaching of professional management accountants, but also in that of accountants in the public practice area.
- In the 1980s much of the accountant's revenue was derived from bookkeeping services, the preparation of tax returns, and the preparation and auditing of historic financial statements. As a source of revenue to most professional accountants, these old niches have declined in prominence and importance, resulting in drastic changes in the nature of professional accountant activity **competing** now with other professions.
- **New business models** that have moved away from hierarchical organisations to networks of various partnerships and joint ventures require styles of management and types of reporting that differ from those that were traditionally used. The new business models have resulted in the need for a whole new set of services aimed at improving the quality of information for decision making.

- The growth of **professional services organisations** (replacing the old auditing firms) has changed the face of the traditional accountancy professionaccounting profession. Professional services organisations derive their revenue from information technology consulting, tax consulting, and legal services.
- No single professional can master every field of activity in which these professional organisations engage. As a result, many of the professional services organisations are organised by business sector. Students are now expected to achieve some type of **specialisation** in order to make them employable (even at prequalification level).
- Changes are also taking place in the **educational system** as a result of the emergence of Internet-based education, co-operative education and competency-based models. In all these instances the emphasis is placed on outcomes.

The key drivers of change in the business environment are summarised in figure 1.1:

Figure 1.1: Key drivers of change



Source: Adapted from Albrecht & and Sack (2001)

1.2.2 *Effect of change on accounting education*

Various studies have been conducted to investigate how accounting education has adapted (or not) to the changing environment (Paisey & Paisey, 2006; Amernic & Craig, 2004; Albrecht & Sack, 2001; Henderson, 2001; IMA, 1999; AICPA, 1998; Fogarty, 1997; Holcomb & Michaelsen, 1996). According to these studies, current accounting education is more or less the same as it was 20 or 30 years ago. In an environment where most of the graduates have traditionally gained immediate, full-time employment upon graduation and in which economies have been strong, it has been hard to acknowledge that there are serious problems with accounting education (Albrecht & Sack, 2001). The danger exists that accounting programmes may lose ground to other business qualifications and educational programmes if accounting education does not align itself with the dramatic changes in business practice. According to Paisey, *et al.* and Paisey[WL1] (2006), professional accountancy bodies have also begun to question whether professional examinations can continue to cover all areas relevant to the work of accountants because of the ever-increasing knowledge base required of accounting students.

One of the key drivers of change in the business environment is the advances in information technology, which is are discussed in the next section.

1.2.3 *Changes in information technology*

The chronological evolvement of information technology can be summarised as follows:

- The first development of computing machinery occurred in the nineteenth century (e.g. Charles Babbage's analytical engine), but were notwas of no practical use to business enterprises at that time (Lubar, 1993).
- In 1889 an American inventor, Herman Hollerith, used cards to store data, which he then fed into a machine that compiled results automatically. These punch card machines were also the first computers to be used in business to process transactions and were used until the 1960s (Lubar, 1993).
- By 1965 most large businesses routinely processed financial information by means of computers (Lubar, 1993).

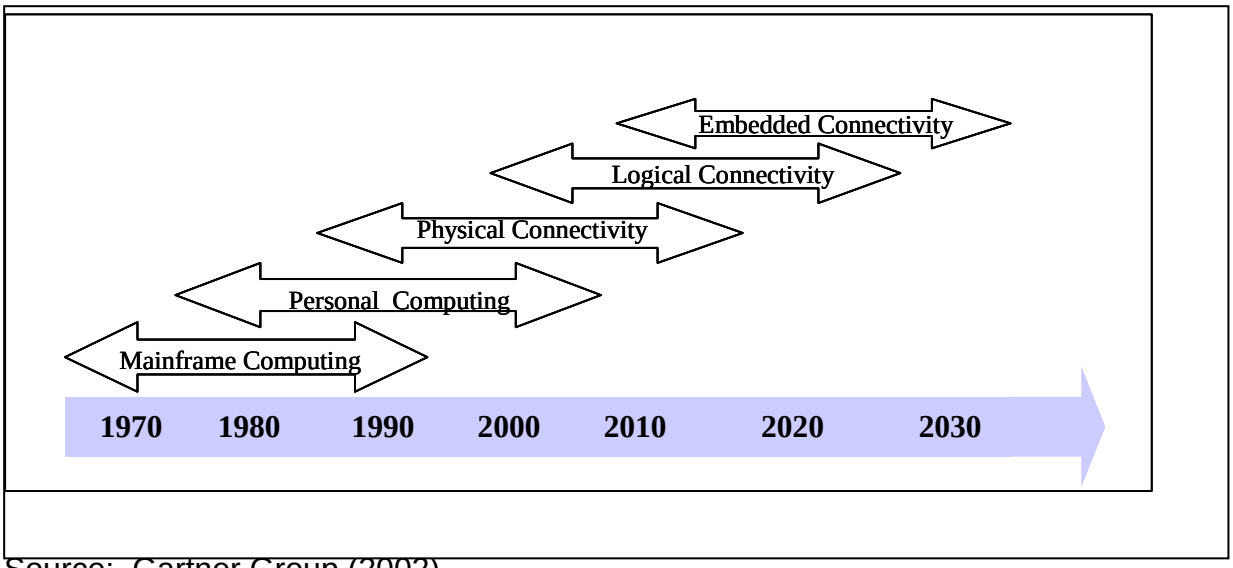
- The integrated circuit replaced transistors, causing major growth in the capacity and use of computers. By 1975 computer manufacturers supplied computers to general consumers. These minicomputers came with user-friendly software packages that offered an array of applications such as word processing and spreadsheets.
- IBM introduced its personal computer for use in the home, office and schools in 1981, that which led to a the widespread use of information technology in business organisations.
- As computers grew increasingly more powerful, they were linked together (or networked) to share resources and enable users to communicate with one another. A global web (i.e. the Internet) now links computers worldwide into a single network of information.

This rapid development of information technology caused the manual processing of accounting information to become rare, and nowadays almost all accounting systems are automated. Computer-based accounting systems are faster, more accurate, more reliable, and able to process large volumes of transactions.

Telecommunications have afforded organisations the power to conduct trade and manage businesses on a global scale. Technology is applied to bring about changes in business goals and to establish not only relationships with customers and suppliers, but also internal operations.

Despite the fact that the information technology industry seems to be faced with the constant and rapid adoption of the latest technology, fundamental shifts of focus in IT move at a much slower pace. According to the Gartner Group (2002), the emphasis on physical connectivity (using physically linked networks) will continue as the wired world gives way to a predominantly wireless one through 2007 to 2010, as is illustrated in figure 1.2. This connectivity and automation will lead to increased opportunities to collect information on the behaviour of customers, employees, partners and other stakeholders.

Figure 1.2: Fundamental shifts in IT focus



Source: Gartner Group (2002)

Smart enterprises (and professionals) will take advantage of this information by employing analytical or predictive techniques to support future decisions and further automation. This will result in analytics becoming more important as more data become more readily available. Data mining and other analytical techniques will be embedded in widely available tools, but understanding them will remain a niche skill set. Analysis techniques will address not only structured data, but also text, audio and video information, while technologies could compound problems such as message and information overload.

The communications, collaboration and information access infrastructure of the electronic workplace is furthermore challenged constantly by factors such as the increasing number of knowledge workers (20% to 30% of the workforce in developed nations by 2005) (Gartner Group, 2002). All these factors will have an influence on *what* professional accountants will do in future, and also on *how* they will do it. The fundamental shifts, as illustrated in figure 1.2, impact on the way individuals and organisations view, experience and use technology as a strategic resource and they will therefore also affect the future task of the professional accountant.

The latest Technology Forecast 2002-2004 (PricewaterhouseCoopers, 2002) and the Technology Report issued by the American Institute of Certified Public Accountants

(AICPA, 2004a) confirm most of the predictions of the Gartner Group. They identify the key issues that affect business organisations as follows:

- Internet computing makes a profound difference to business computing with today's telephone networks replaced by Internet Pprotocol networks.
- The use of grid computing enables makes the large-scale aggregation and integration of computing, storage, network and other resources across organisational boundaries possible. Research into grid computing will solve critical problems that enterprises are facing now in building distributed inter-enterprise applications needed for e-business.

An analysis of the envisaged changes in the business environment shows that the future role of the professional accountant will change dramatically – from traditionally being a collector and disseminator of information to in future being an interpreter and strategic decision maker. The future accountant will spend more time analysing, interpreting and communicating information to relevant decision makers. To perform these tasks, the future accountant will require not only strong analytical skills, but also strong communication skills linked with business awareness. These changes will also affect the education and training required to prepare prospective accountants for their new role.

Professional accountants are organised into various professions that also regulate the relevant standards of education. The accountancy professionaccounting profession should therefore manage the changes to the environment in which professional accountants operate (including those due to the growing use in information technology) to ensure that the professional accountant remains relevant and adds value to the businesses of the future.

1.2.4 *Changes in the accountancy accounting profession*

The chartered accountancyaccounting profession has evolved over a number of years:

- On 6 July 1854 the Institute of Accountants in Glasgow, Scotland, petitioned the Queen for the granting of a Royal Charter. This petition was signed by 49 accountants (ICAEW, 2003).

- In 1880 the newly formed Institute of Chartered Accountants of England and Wales brought together all the accountancy organisations in those countries and standards of conduct and examinations for admission to the Institute were drawn up (ICAEW, 2003).
- In 1887 the American Association of Public Accountants was formed (ICAEW, 2003).
- In 1919 the Institute of Cost and Works Accountants was founded in London with the objective of providing the range of information needed to plan and manage modern business organisations. In 1986 this Institute changed its name to the Chartered Institute of Management Accountants (CIMA, 2003).
- In the Republic of South Africa, the local Institute of Accountants and Auditors was formed in 1894, with an initial membership of 65 people. In 1927 the Chartered Accountants Designation (Private) Act was passed, whereby the exclusive right to use the designation “Chartered Accountant (SA)” or “CA (SA)” was conferred on members (SAICA, 2003a).
- In 1977 representatives from 63 accountancy professional bodies in 51 countries signed a charter that resulted in the establishment of the International Federation of Accountants (IFAC). Earlier, the International Accounting Standards Committee (IASC) had been established in London in 1973.

IFAC and IASC have subsequently been recognised universally as the bond that combines all aspects of the accountancy professionaccounting profession (Herrera, 1997). Both these bodies have been instrumental in putting establishingin place a set of comprehensive accounting standards and in encouraging member bodies to adopt them. In 2003 IFAC had 155 member bodies in 113 countries that represented more than 2 million accountants (IFAC, 2003a). The objective of IFAC is to develop the profession and harmonise its standards worldwide, thus enabling accountants to provide services of consistently high quality in the public interest by staying pertinent to the changing environment.

1.2.5 *The accountingancy profession’s response to changes in the environment*

Research done by Albrecht and Sack (2001) revealed a general inclination away from traditional accounting and auditing careers towards consulting type of work in the accounting/finance area of a business organisation. In American surveys involving academics and practitioners in the accounting field, accounting education was perceived to have a low value. It seems that accounting education no longer provides a clear advantage in preparing students for performing the expanding array of services required from present-day accountants, while some negative aspects of accounting work are also a cause of concern to them. The following are some of the most important findings emerging from a limited survey conducted in South Africa among students enrolled in programmes to become professional accountants (Wessels, 2004:231):

- Only 34% of students indicated they would like to perform the traditional function of an auditor working for an auditing firm, while 59% of students would like to work outside of public practice and the rest (7%) do did not want to pursue the accountingancy profession.
- 42% of students believed that there is was too much emphasis on technical training in accountancy-related subjects and not enough on general business skills and business awareness.
- 70% of students feel felt that the inclusion of information technology as one of the core subjects is was crucial to their future career as professional accountants.

Most professional accounting institutes have admitted problems with the profession as far as career-image problems are concerned and they recognise the need for changing the education and training syllabi, as will be discussed in chapter 2 (section 2.3). Some of the more specific problems identified by Albrecht and Sack (2001) include the following:

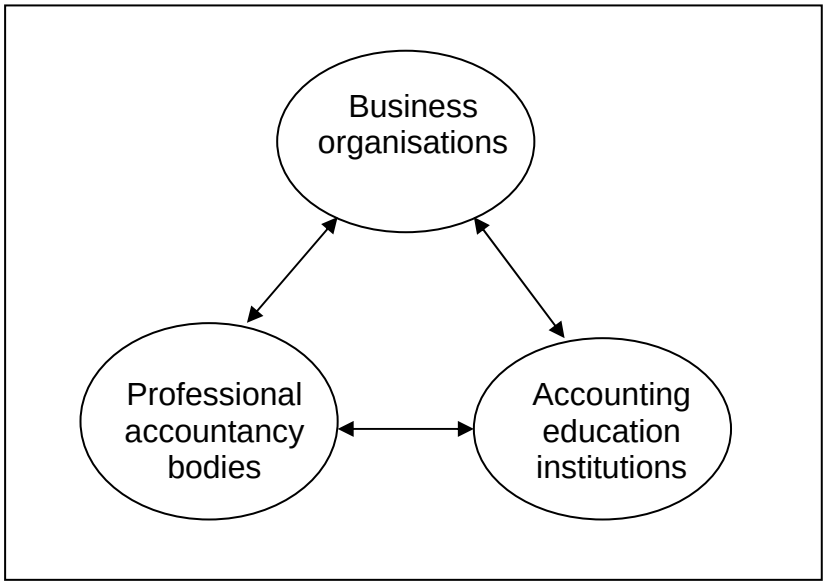
- Curricula are too narrow, outdated and/or irrelevant.
- Accountant training focuses too much on content at the expense of skills development.
- Accounting is being taught as if information were still costly. Information is now inexpensive and the part of the syllabus devoted to information gathering and recording is a waste of time.

- Students are not adequately exposed to the impact of technology on business or to ways in which technology can be leveraged to make business decisions.
- Accounting departments are often isolated from other academics disciplines and from business professionals.

1.2.6 *Impact of changes on delivering competent accountants*

From the discussion thus far in section 1.2 it is clear that the aim of the accountancy accounting profession is to ensure that students are delivered to the business environment that who are regarded as competent accountants are delivered to the business environment. The main constituents that interact to ensure the achievement of this goal were identified as business organisations, professional accountancy bodies and educational institutions (as illustrated in figure 1.3). Business organisations are affected by new and changing demands from their business environment. Professional accountancy bodies determine the standards and competency requirements of their members based on the basis of the needs of the business organisations. Educational institutions are responsible for the education of accounting students and rely on the standards and competency requirements of professional accountancy bodies to prepare students to enter the profession as competent accountants.

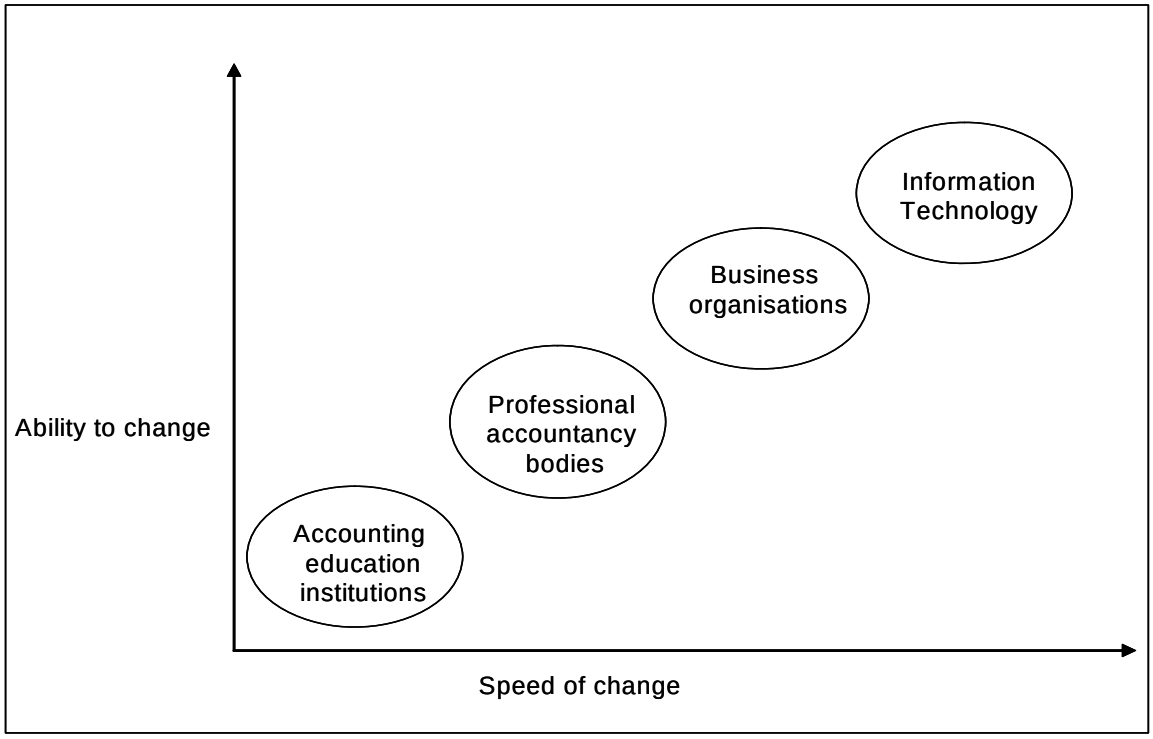
Figure 1.3: The constituents involved in delivering competent accountants



For students to be regarded as competent accountants, the outputs and requirements of all three constituents should be aligned. This will be achieved if the requirements of the business environment are continually identified and addressed in the education standards and guidelines issued by professional accountancy bodies and then taught to students during the education process. However, as was discussed in this section reveals 1.2, the requirements and outputs of these constituents are not in line. This may result in students who are, entering the profession, not acquiring the skills to be competent accountants.

The advances in information technology have been identified as a key driver that affects the business environment and therefore also affects the competencies required from future accountants. Figure 1.4 illustrates why, according to the discussion in this section, the goal of delivering accountants that who are competent in using information technology, may not be reached.

Figure 1.4: Link between outputs and needs of constituents



As is illustrated in figure 1.4 and as was discussed in section 1.2.3, information technology changes at a rapid pace. Organisations have to adapt to and incorporate

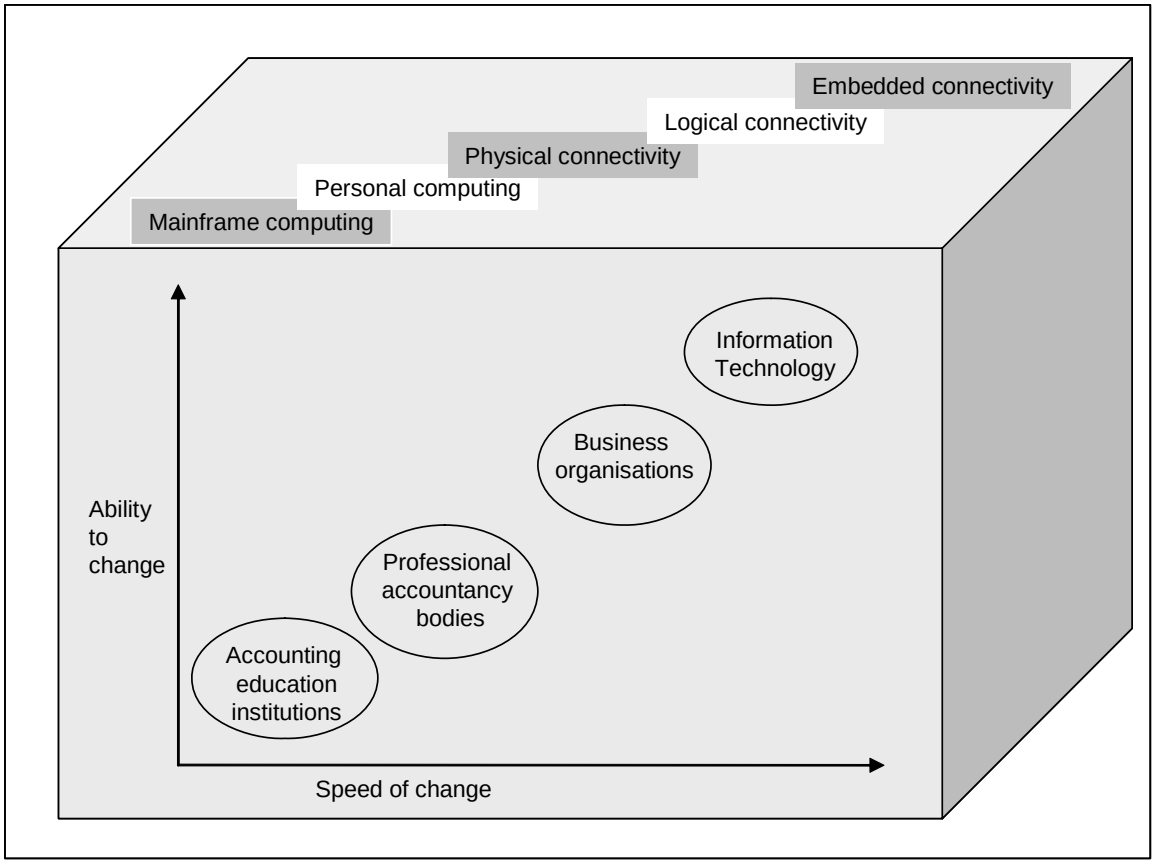
these changes in IT to remain competitive, although the speed at which organisations change due to their ability to adapt to these changes may differ in various business environments as well as between individual organisations. Professional accountancy bodies should define the standards for the education of their members through by continually incorporating the needs of the business environment that their members are engaged in with the syllabi that they prescribe. As was discussed in sections 1.2.2 and 1.2.4, professional accountancy bodies are not adapting to or incorporating these changes on a regular basis. Universities (responsible for the formal education of students) adhere to education guidelines (in the form of syllabi prescribed by professional accountancy bodies) and need to adapt their teaching and curricula to changes in the syllabi. As was discussed in section 1.2.5, accounting education has changed very little in the past 20 to 30 years, ewhich emphasisesmphasising the inability of universities to rapidly change or adapt their curricula to changes in the business environment.

This misalignment between the outputs and needs of the various constituents, as was illustrated in figure 1.4, may result in a gap between the competencies acquired by students during their formal education and the competencies required of them by from business organisations. The cause of this misalignment can be ascribed to:

- the fact that over *time* business organisations change due to changes in their business environment, but the ability to adapt to these changes in a timely fashion varies between the constituents; and
- *paradigm* differences in how information technology (and the impact of IT on the business environment) is viewed by the constituents as well as individuals within the constituents. In Figure 1.2 illustrated the various approaches (fundamental shifts) of how IT has developed, was illustrated. The various constituents (and individuals within these constituents) view and use IT having with any one of those IT approaches (e.g. some may still be stuck in a mainframe computing focus, while others may have moved on to networks using a logical connectivity focus).

Figure 1.5 illustrates the gap that exists between the various constituents because of the ability (and inability) of some constituents to adapt to changes over time, but and also because of paradigm differences.

Figure 1.5: Misalignment through time and paradigm differences



As was illustrated in figure 1.4, the misalignment that is caused by the varying abilities of constituents to adapt to changes in the business environment over time may cause a gap between the competencies acquired by students during the accounting education process and the competencies required from of them by business organisations. However, the specific IT competencies required and acquired by students are also affected by the specific paradigm focus a constituents (or an individual) have on IT. Figure 1.5 illustrates that, on a different dimension, the extent of the gap is also influenced by paradigm differences of how IT is viewed by the various constituents as well as by the different views of individuals within the constituents. For example, organisations that have a physical connectivity focus ofn technology will expect different competencies from accountants as than those organisations that have already moved on to an embedded connectivity focus. Therefore the paradigm that constituents and individuals use with regard to information technology have has a direct impact on the IT competencies they deem important for students to have.

The study of information technology has been identified as one of the main areas of concern in the education and training of professional accountants in South Africa. While other professional institutes have changed the exposure to information systems, academic institutions in South Africa still spend a relatively small amount of time on the study of information technology.

Information technology has been included in the curriculum for professional accountants for more than three decades. For example, the Certified General Accountants' Association of Canada (CGA) introduced a course in Information and Computers as long ago as 1970 (IFAC, 1995a). However, the teaching of information technology was never seen as a core subject for the training of professional accountants. If it is true that the environment in which future professional accountants will operate is changing (with technology being a major force driving such change), and that there is a misalignment between the outputs and needs of constituents involved in the education of accountants caused throughas a result of time and paradigm differences, it is essential to assess whether current educational practices and standards are preparing accountants sufficiently for this future.

1.3 Research context

In South Africa students complete their formal education at universities that offer programmes that are accredited to a professional accountancy body before they commencing withe their practical training. Changes in the South African business environment also impact on the competencies required of these students on completion of their formal education. In the previous section the potential existence of a gap between the IT competencies required from students by business organisations and those acquired by students was discussed. Because of the potential existence of this gap, the question arises whether students who have completed their formal education at universities in South Africa and commence their practical training, are competent in using information technology within the South African business environment.

To address this question, it is necessary to firstly define the IT competencies required of students on completion of their formal education (based on the basis of the

demands of the business environment) must first be defined, and then to it must be assessed whether South African universities produce students that who possess these skills. The outcome of this assessment will either confirm or disprove the existence of a gap between the IT competencies required from accountants and the IT competencies that are acquired during the formal education process. The approach that will be followed to investigate the potential gap is to:

(a) *define* the critical IT skills required of students on completion of their formal education for them to be regarded as competent within the South African business environment;

(b) obtain the *perspectives* of the universities on the current education offered by South African universities to determine whether students have acquired these critical IT skills on completion ofwhen they have completed their formal education; and

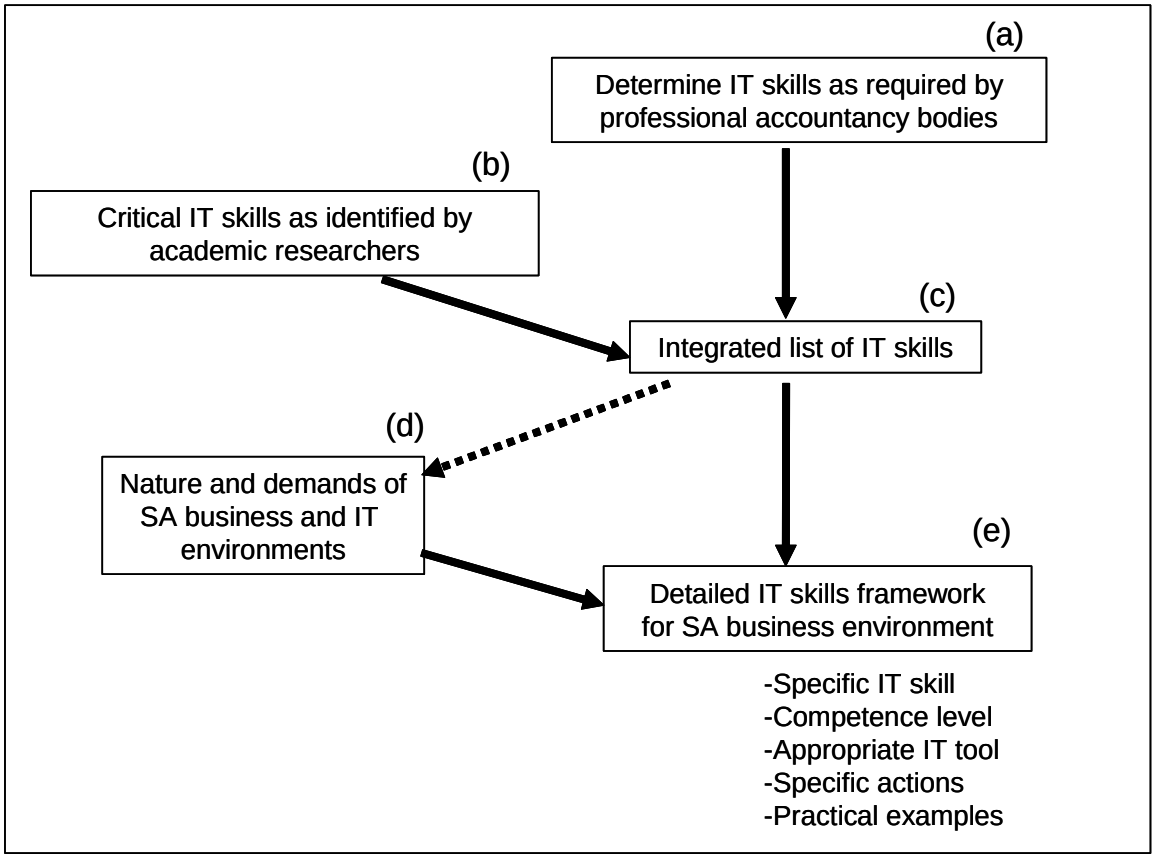
(c) based on the basis of the results of (a) and (b), to provide *strategic guidance* and discuss strategies that can be used in South Africa to ensure that students possessing these skills are produced that possess these skills.

The context in which each of these steps are is addressed is discussed in the rest of this section.

1.3.1 *Development of an IT skills framework for South Africa*

Before the current IT education offered to students can be assessed, it is necessary to define a relevant set of IT skills must be defined that students, wanting who want to become accountants within the South African business environment, should possess on completion of their formal education. The approach that will be followed to define an IT skills framework is depicted in figure 1.6.

Figure 1.6: The conceptualisation of an IT skills framework



Professional accountancy bodies are responsible for setting qualification standards for the admission of students as members. Through ongoing research they have to ensure that these new members possess the competencies required to be relevant within the business environment in which they function in. In setting syllabi and revising it them on a regular basis, professional accountancy bodies define the criteria they regardwith which students should acquireshould comply to show competence. The syllabi prescribed by accountancy bodies include the knowledge requirements, skills requirements, and values, ethics and attitudes expected from their members (IFAC, 2003b:20). Professional knowledge constitutes the essential body of knowledge (like accountancy and other business disciplines) (IFAC, 2003b:21). Professional skills include the various types of abilities required by students to apply their knowledge appropriately in a professional context (IFAC, 2003b:21). Professional values, ethics and attitudes refer to the behaviour and characteristics that identify accountants as members of a profession (IFAC, 2003b:22). This research aims to identify the information technology skills that students should possess on completion of their formal education, where IT skills refer

to the student's ability to apply his/her professional knowledge in dealing with business and accounting issues and problems in by using information technology as a tool.

In defining the IT skills framework the approach will be to:

- Analyse the syllabi prescribed by a number of professional accountancy bodies (including IFAC, ICAA, CICA, ICAEW, AICPA, SAICA, CIMA and IMA) to identify all references to IT skills ((a) in figure 1.3).
- Conduct a thorough literature search to identify and include the results of other research outside those that initiated by the professional accountancy bodies that refers to IT skills required of accountants ((b) in figure 1.3).
- Compare the results of the literature review ((b) in figure 1.3) with the list of IT skills as identified in (a) (figure 1.3) to compile a set of IT skills that students (wishing to become accountants) should possess ((c) in figure 1.3).
- Analyse the South African business environment to determine the work role of accountants as well as the information technology that is used most frequently by accountants in this environment ((d) in figure 1.3).
- Compile, fFrom the research and investigations ((a), (b), (c) and (d) in figure 1.3), an IT skills framework ((e) in figure 1.3) will be compiled that defines the IT skills regarded as important for students to possess on enteringwhen they enter the South African business environment.

In defining this IT skills framework ((e) in figure 1.3) the aim will be to:

- Analyse and consider each IT skill, as identified in (c) in figure 1.3, to consider its importance and application within the South African business environment. Within the overall education programme offered to students, only a limited amount of time can be spent on IT education. The approach in conceptualising the IT skills framework will be to identify those IT skills that are *critical* for students to possess on enteringwhen they enter the South African business environment.
- Identify the IT tool most commonly used by South African organisations. The purpose of IT education offered at universities should be to ensure that students acquire the knowledge and skills required to use information technology in

dealing with business and accounting issues and not to train students in using a vast number of software packages. In conceptualising the IT skills framework, the approach will be therefore be to limit the number of software packages that students are exposed to, to to those used most frequently by business organisations, and to indicate how students can acquire all the critical IT skills using this limited range of software packages. The focus could then be to ensure that students acquire the critical IT skills, rather than to focus on gaining general knowledge of a vast number of software packages. The students should then be able to apply this skill in future when utilising other IT tools (software packages) as well.

- Expand the IT skills framework to provide not only the IT skills (or outcome) that is are required, but to include specific actions that students should be able to perform in order to acquire that a specific skill.
- Include references to the SAICA syllabi (SAICA, 2005c) to identify practical examples from the knowledge areas of the SAICA syllabi that educators can use to integrate professional subjects with information technology.

The IT skills framework ((e) in figure 1.3) can be used by educators to ensure that students that who enter the business environment as trainee accountants possess the IT skills required to be regarded as competent accountants. This framework will also be used as a benchmark in the investigation of the current education offered to students at South African universities.

1.3.2 *Perspectives of role-players at South African universities on IT education*

Students receive their formal education at South African universities. During this education process they should acquire those the IT skills necessary to be competent as trainee accountants on entering the South African business environment. In the second part of the research the perspectives of role-players at South African universities regarding IT education will be investigated to determine whether students currently acquire these skills during the education process, as well as to determine the impact that paradigm differences on in IT have on the education offered by the various institutions (as illustrated in figure 1.5). The teaching of information technology education at South African universities has traditionally been regarded as not asless important as than the education teaching of the other professional

subjects. This has resulted in universities placing attaching varying degrees of importance to the inclusion of information technology in the curricula offered to studentsvarying degrees of importance on the inclusion of information technology in the curricula offered to students. The concept of information technology education is also interpreted differently by educators because of paradigm differences in the focus of IT. This may result in some educators over -emphasising the acquisition of IT knowledge and placing limited emphasis on the acquisition of IT skills. Other educators may focus on the ability of their students to acquire the skill to be able to so that they can use a wide range of software packages.

A position audit of the current education instruction offered to students regarding information technology will be conducted through a detailed analysis of documentation available on all the South African universities with accredited accounting programmes. The aim of the document analysis will be to determine who, within the universities, is responsible for the IT education of students, whether the students have access to an adequate IT infrastructure, what the extent of the IT exposure is that students receive compared to that of the other professional subjects, and to identify which of the IT skills (using the IT skills framework as a benchmark) students currently acquire.

The perceptions of role-players at universities will also have to be obtained in order to observe the typical actions and reactions of these role-players if they were asked to implement changes to the current IT education offered to their students. To obtain the perceptions of the role-players an exploratory questionnaire will be compiled and sent to all the universities with accredited programmes. As illustrated in figure 1.5, the existence of a gap may exist between the competencies acquired at universities and those required by the business environment may exists because of the paradigm differences that exist between organisations, universities and individuals on how IT is viewed. In order to compile a questionnaire for empirical analysis, it is important that respondents have similar views on IT to allowmake sensible conclusions to be drawn. Because of these paradigm differences, the questionnaire will not be used for empirical analysis, but rather to gain the respondents' perspectives on the typical issues and problems experienced by universities and academics when they are faced with issues about the information technology education of their students.

1.3.3 *Strategies*

As a resultOn the basis of the research, as discussed in sections 1.3.2 and 1.3.2, a number of strategies will be identified and discussed that would include recommendations for to the professional accountancy bodies in South Africa, South African universities and lecturers responsible for the IT education on the integration of IT with the professional subjects. In the discussion of strategies, the approach will be to supply guidance to the various stakeholders on how the gap that exists between the IT competencies that are required from by the business environment and those that is are currently acquired by students could be closed, taking into consideration the paradigm differences that exist regarding information technology.

In the next section the research problem will be defined and discussed in detail.

1.4 Problem definition

Students who qualify as accountants function within a specific business environment. This business environment is constantly changing and is creating new demands on the services offered by the accountancy professionaccounting profession. To be competitive and add value in this changing environment, students should acquire the knowledge and skills that are relevant to the specific environment in which they are going to operate. Professional accountancy bodies determine the entry requirements for membership by prescribing the knowledge and skills that members should possess if they intend joining that professional body. The professional accountancy bodies therefore have an obligation to ensure that students who enter the profession possess the relevant knowledge and skills to be competent and remain competent within the business environment in which they function.

One of the key drivers of change in the business environment is advances in information technologies. These advances have an effect on *what* accountants do and *how* they do it. Accountants require the knowledge and skills to understand and use information technologies to enable them to function within a business environment that is increasingly using information technology more extensively in all areas of business. The question arises whether students that who have completed

their formal education and enter the profession as trainee accountants in South Africa, possess the knowledge and skills to enable them to interact with and use information technology effectively.

The main aim of this research is to determine whether, and if so, to what extent, students who enter the accountancy profession as trainee accountants in South Africa possess the information technology skills required to be competent within the South African business environment. The main aim of this research is to develop a framework that sets out the IT competencies required of students who enter the accounting profession as trainee accountants in South Africa and to evaluate the current education these students receive at South African universities.

1.5 Research approach

The approach that will be followed to address the research problem is to identify and evaluate the various constituents that contribute to or influence the formal education of accounting students in South Africa. The formal education of accounting students in South Africa is influenced by:

- *professional accountancy bodies* that prescribe the knowledge and skills they require their future members to possess;
- the *business environment* in which accountants are required to apply their knowledge and skills; and
- *South African universities* that are responsible for the formal education of students and that have to ensure that students acquire the prescribed knowledge and skills in order to be accepted as trainee accountants by the professional accountancy body (and training firms,) and that have to ensure that they are competent to practise as accountants within the South African business environment.

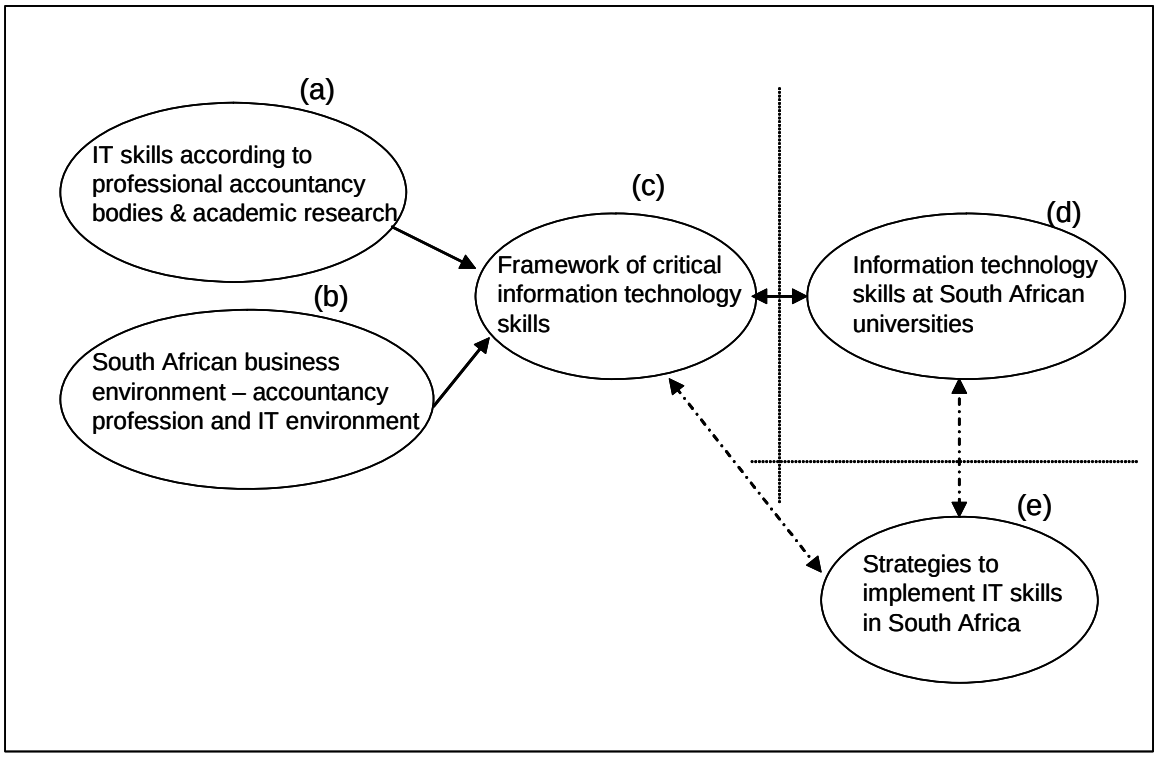
For accountants to be regarded as competent within the South African business environment, the objectives and output from all three constituents should be aligned. This could be attained if professional accountancy bodies regularly research the *South African business environment* in which their members will function to determine the knowledge and skills that are relevant for and required by that business environment. The *professional accountancy body* (like SAICA) could then

set clear guidelines on the knowledge and skills they it requires from their its future members. *South African universities* should incorporate the knowledge and skills as determined by the professional accountancy body into their programmes and ensure that the students they deliver to the profession possess these the required knowledge and skills.

As this research focuses on the information technology skills required by students after the completion of their formal education, the approach that will be followed in addressing the research problem (as illustrated in figure 1.7) is to:

- to determine and evaluate the information technology skills that are prescribed by professional accountancy bodies and other relevant academic research studies ((a) in figure 1.7);
- to investigate the South African business environment to determine the information technology skills that accountants need ((b) in figure 1.7);
- to compile a detailed IT skills framework that describes in detail the IT skills required from of students that who have completed their formal education ((c) in figure 1.7);
- to evaluate the education students receive at South African universities and identify the information technology skills that are currently taught to students ((d) in figure 1.7) and compare these IT skills to the IT skills framework as developed in (c) (figure 1.7);
- to obtain the perceptions of role-players at universities on the education teaching of information technology ((d) in figure 1.7); and
- to identify and discuss strategies that can be employed to ensure that students acquire the critical IT skills needed to be competent within the South African business environment ((e) in figure 1.7).

Figure 1.7: Research approach



As illustrated in figure 1.7(a), the IT skills as prescribed by professional accountancy bodies up to the point of entry as professional accountants will be investigated. Other relevant academic research that has been conducted will also be discussed to evaluate whether the IT skills as prescribed by the professional accountancy bodies are up- to- date, complete and relevant, and to identify those IT skills that are critical for students to possess on completion of their formal education.

The South African business environment (figure 1.7(b)) will then be analysed to determine the IT skills accountants need to be competent in performing their duties. This investigation will include an analysis of what accountants do (i.e. in what business environment and role they function) and the information technology environment they will encounter. The approach to this investigation is not to conduct a detailed study of the South African business environment, but rather to identify the typical environment students will encounter on completion of their formal education and on entering the business environment as trainee accountants. This investigation will identify those IT skills that are important for most students to possess to be competent in using IT in the South African business environment, as well asand will also identify the IT tools most frequently used by South African organisations.

The information gathered from these two investigations (professional accountancy bodies/academic research, and South African business environment analysis) will be used to develop a framework of the IT skills (figure 1.7(c)) that students require on entering the profession to be competent trainee accountants. The framework will be developed by discussing each IT skill, as identified through the analysis of the professional accountancy bodies and academic research (figure 1.7(a)), to determine whether that IT skill is relevant within the South African business environment (figure 1.7(b)), and to recommend how that IT skill can be taught to the students using examples and tools similar to what those they will find in the business environment. This framework will be the benchmark against which the education of students could be measured to address the research problem of whether students possess the required information technology skills.

The current education provided by South African universities will be investigated and compared with the IT skills framework (figure 1.7(d)) to determine whether, and if so, to what extent, students who enter the profession as trainee accountants possess the IT skills required to be competent within the South African business environment.

Because of the impact of paradigm differences that exist, the perceptions on and reactions of role-players at South African universities on to information technology education will be obtained through by means of an exploratory questionnaire. Strategies will be identified and discussed that can be employed within the South African business environment to ensure that students that who have completed their formal education, possess the IT skills required to be competent trainee accountants will be identified and discussed ((e) in figure 1.7).

1.6 Research scope, limitations and exclusions

Accountants are required to possess the knowledge and skills as determined by the relevant professional accountancy body. For the purpose of this research, the focus will be on the skills that students require to use *information technology* on completion of their formal education. Skills are defined as the ability to apply professional knowledge and professional values and attitudes appropriately and effectively in a professional context (IFAC, 2003b:21). The emphasis is therefore on the student's ability to use information technology as a tool to enable him/her to apply his/her

knowledge of other areas (i.e. financial reporting, auditing, taxation, managerial accountancy and financial management) to solve business and accounting problems. This research therefore excludes the knowledge students require about information technology.

The training of professional accountants consists of two distinct phases, namely formal education and practical training. In South Africa most students complete their formal education at universities that offer programmes accredited by a professional accountancy body (like SAICA). Knowledge and skills are imparted to students during their four years of formal education at South African universities. The practical training of accountants involves three years of traineeship at recognised training firms (like auditing firms and business organisations). For students to qualify as professional accountants in South Africa there are two entry level requirements that should be met. The first entry level requirement has to be complied with after students complete their formal education (at universities) and are accepted at firms as *trainee accountants*. Most professional accountancy bodies (including SAICA) set examinations to evaluate the students' knowledge of and skills of acquired from their formal education. The second entry level requirement occurs after the completion of the practical experience phase, when students need to fulfil further requirements as set by the professional accountancy body (for example by submitting a record of practical experience, or writing another examination) to be allowed as to become full practising members of the profession. The focus of this research is on the education provided during the formal education of students in South Africa as provided by *universities* with accredited accountancy programmes. This formal education consists of a three-year degree programme, followed by a diploma or honours programme in the fourth year. It therefore excludes the training provided during the three years of practical experience at a training firm, although in the initial part of the research reference will be made to the knowledge and skills required when candidates are accepted as full practising members. The universities that have been included in this research are:

Nelson Mandela Metropolitan University
North-West University: Potchefstroom campus
Rhodes University

University of Cape Town
University of Johannesburg
University of KwaZulu-Natal
University of Port Elizabeth
University of Pretoria
University of South Africa
University of Stellenbosch
University of the Free State
University of the Western Cape
University of the Witwatersrand

Accountants need to be competent to function within a specific environment. South Africa is viewed as having a third -world or emerging economy. This makes other demands of accountants than those that would have been made by a first -world economy. This research will focus on the information technology skills required of accountants functioning within the *South African business environment*. A number of professional accountancy bodies operate in the South African business environment (including SAICA, CIMA, ACCA and CPA). As the CPA focuses on providing inmeeting the need for accounting support staff in commerce and industry rather than on for professional accountants and auditors, they wereit was excluded from this research (CPA, 2006).

Although a detailed search for relevant literature was conducted, only a limited number of research studies and articles could be identified. No references to any Masters- or PhD dissertations that could be used were identified. Professional accountancy bodies initiated most of the research to investigate the IT competencies expected fromrequired of their members. In the list of sources there are references to publications by professional accountancy bodies that contain research conducted on their behalf by a number of prominent academics (e.g. 'Into the 21st century with information management' (IFAC, 1998) contained eight articles by various researchers). According to Apostolou, Watson, Hassel and Webber (2001), that who reviewed accounting education literature published from 1997 through 1999, and Watson, Apostolou, Hassell and Webber (2003), that who organised and summarised the accounting education research of 206 articles that was had been

published during the period 2000 to 2002, a very limited number amount of research was published that could be used in this research.

Because of the existence of paradigm differences in with regard to how information technology is viewed by role-players in the education of students, the IT framework that was defined in this research was not validated through empirical analysis because of the distorted answers that would have resulted from these paradigm differences (see figure 1.5). The approach that was followed was rather to obtain the perceptions of role-players through by means of an exploratory questionnaire to identify strategies on how to implement the IT skills framework while taking the paradigm differences into account the paradigm differences.

1.7 Research design

The aim of this research is to determine whether students who enter the accountancy professionaccounting profession as trainee accountants possess the IT skills required to be regarded as competent in using information technology within the South African business environment. This requires the development of a set of IT skills that are relevant within the South African business environment and that can be used to evaluate whether students acquire these skills during their formal education offered by South African universities. As this will require a qualitative research approach (Van der Merwe, 1996:283-290; Babbie & Mouton, 2001; Mason, 2002:24-27; Myers, 1997; Emory, 1980:67-77), the research problem will be stated in a number of research questions. A number of investigative questions should be addressed first in order to answer the research problem (Emory, 1980:65). These layers of questions will form the basis of the design of this research.

Research question:

Are students that who have completed their formal education and who enter the profession in South Africa as trainee accountants competent in using information technology within the current South African business environment?

Investigative questions:

1. What are the IT skills as prescribed by professional accountancy bodies?

2. Are the guidelines for these IT skills guidelines complete, relevant and up- to-date?
3. What are the nature and demands of the South African business and information technology environment in which accountants will function?
4. What are the critical IT skills required of accountants to be competent within the South African business environment?
5. To what extent will students be able to acquire these IT skills through the current education offered by South African universities?
6. What strategies can be employed within the South African business environment to ensure that students that who have completed their formal education possess the IT skills required to be regarded as competent trainee accountants?

1.8 Research methods

Various research methods will be employed to address the investigative questions. The research methods will describe the data sources, methods of data generation and justification for using a specific method.

1.8.1 *Investigative questions 1 and 2*

What are the IT skills as prescribed by professional accountancy bodies? Are these IT skills guidelines complete, relevant and up -to- date?

The aim of these two questions is to define a set of IT skills that are generally expected to be important for students to have by investigating the IT skills as prescribed by accountancy bodies as well as the IT skills proposed by academic researchers. Extensive research has been done by a number of prominent accountancy bodies and academics on the knowledge and skills required of professional accountants. The data sources that will be used consist of the documented findings of their research. These documents will be analysed and compared to extract a set of IT skills that are deemed to be necessary for a person to be regarded as an accountant who is competent in using technology.

1.8.2 *Investigative question 3*

What are the nature and demands of the South African business and information technology environment in which accountants will function?

A number of professional accountancy bodies operate within the South African business environment, with their members employed in various industries and work roles within these business organisations. A profile will be compiled of where accountants work within the South African business environment (i.e. the work role). By understanding If an understanding of where they work and what they do can be obtained, the information technology they interact with and its use will be determined.

The data sources that will be used consist of membership information as supplied by the various professional accountancy bodies in South Africa (South African Institute of Chartered Accountants (SAICA), Chartered Institute of Management Accountants (CIMA), Association of Chartered Certified Accountants (ACCA)). This information will be analysed to compile a profile of where accountants work within the South African business environment.

The South African business environment will be investigated to determine the extent to which IT and software applications are used in business organisations. The data sources that will be used include research and survey reports compiled on the South African business and IT environment by reputable research institutions (e.g. BMI-Techknowledge, Gartner Research, CS Holdings, Accountancy SA, World Wide Worx). These research and survey reports, together with the analysis of where in the South African industry accountants operate, will result in the compilation of a profile of the typical South African business and IT environment that accountants will encounter and that they are expected to be competent in interacting with.

1.8.3 *Investigative question 4*

What are the IT skills required of accountants to be competent within the South African business environment?

The aim of this question is to compare the IT skills as prescribed by professional accountancy bodies with the demands and tools used within the South African business environment to compile a framework of IT skills that are required of

students entering the profession in South Africa. The framework will be developed by discussing each IT skill, as determined by the result of the investigation of the professional accountancy bodies and academic research (section 1.8.1), indicating whether that IT skill is relevant within the South African business environment (section 1.8.2), and recommending how that IT skill can be taught to the students using examples and tools similar to those they will use in the business environment. Each IT skill will be elaborated on to include the depth of study as well the elements that could be covered in acquiring that skill. This framework of IT skills will be the benchmark used for evaluating the existing education of accounting students at South African universities.

1.8.4 *Investigative question 5*

To what extent will students be able to acquire these IT skills through the current education offered by South African universities?

The aim of this investigative question is to determine whether students entering the South African business environment as trainee accountants have acquired the critical IT skills as determined in this research (section 1.8.3). Through this analysis, shortcomings (weaknesses) and strengths of current education practices will be identified and discussed.

The current practices employed by universities to ensure that their accounting students are competent in using information technology will be investigated. The data sources that will be used are the programme and course material from all the South African universities that offer accounting programmes that are accredited with a professional accountancy body (e.g. SAICA, CIMA, ACCA). The course material to be analysed includes material that is available on the websites as well as information contained in the year books of the respective universities.

1.8.5 *Investigative question 6*

What strategies can be employed within the South African business environment to ensure that students that who have completed their formal education possess the IT skills required to be regarded as competent trainee accountants?

Before strategies are identified and discussed to improve the IT education of students at South African universities, the perceptions of role-players at universities will be obtained through usingby means of an exploratory questionnaire. The exploratory questionnaire will be compiled and sent to all the programme leaders at universities that offer accountancy programmes that are accredited with professional accountancy bodies in South Africa. The aim of this exploratory questionnaire is to determine the perceptions of the programme leaders on how they would ensure that their students acquire the IT skills necessary to be competent at their point of entry as trainee accountants.

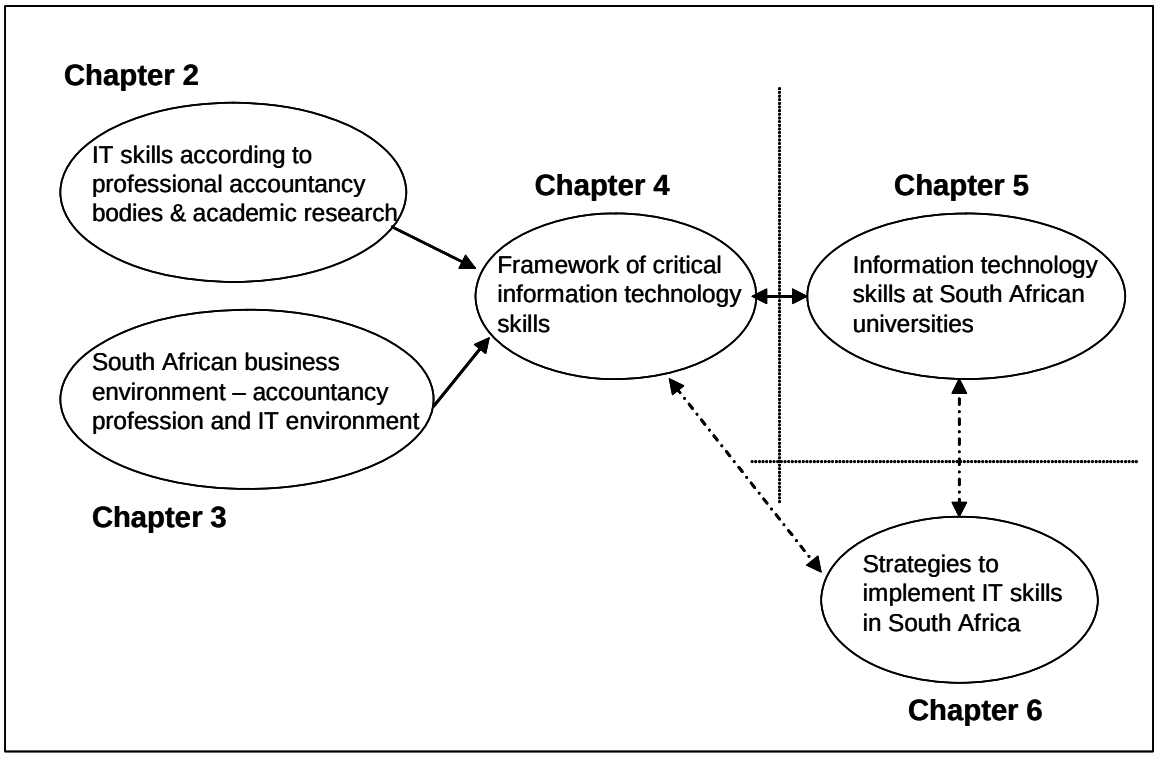
1.9 Importance of research project

Various stakeholders can benefit from the output of this research. *Students* who want to qualify as professional accountants will be more employable and will be able to do their job more effectively and efficiently if they are able tocan use technology. *Business organisations and auditing firms* would will not need to retrain new recruits on how to use technology, as the recruits will be competent when qualifying as trainee accountants. *Professional accountancy bodies (*e.g. SAICA, CIMA, ACCA) can use this information to update and improve their syllabi to ensure that universities receive clear guidance on the IT skills that their students should possess. *Academic staff* at South African universities would will know what IT skills they should focus on when educating students at their institutions. *Professional accountancy bodies in other parts* of the world can use the output of this research to develop an IT skills framework for their specific business environments and to evaluate the IT education offered to their students. *Academic researchers* can engage in more detailed research on issues identified in this research.

1.10 Roadmap

Figure 1.8 illustrates how the rest of the research has been structured:

Figure 1.8: Roadmap



Chapter 2: Critical IT skills required by professional accountants

Chapter 2 addresses investigative question 1 (section 1.8.1) to determine a set of IT skills that are generally accepted to be important for accountants to have by investigating the IT skills as prescribed by accountancy bodies as well as the IT skills proposed through academic research. Research that has been conducted regarding the future of the accountancy professionaccounting profession and the profile of the professional accountant is analysed. This chapter also investigates research that has been done to compile a list of critical IT skills that accountants require to perform their duty. Guideline 11 (*IEG 11*), as compiled by IFAC, forms the basis of the framework, but is adjusted to include other research conducted on the required IT skills of accountants. The chapter concludes with a general set of critical IT skills required by professional accountants. This chapter was published in Meditari Accountancy Research, volume 13(1) in 2005.

Chapter 3: South African business and IT environment

Investigative question 2 (section 1.8.2) is addressed to identify the nature and demands of the South African business and information technology environment in which accountants function. This chapter focuses on an analysis of research done on

the South African accountancy professionaccounting profession and business environment, and the use of technology within these organisations to highlight areas (like software and/or tools) that are vital for accountants operating in South Africa.

Chapter 4: IT skills framework for the training of South African accountants

The aim of this chapter is to address investigative question 3 (section 1.8.3) by comparing the IT skills as prescribed by professional accountancy bodies with the demands of and tools used within the South African business environment to compile a framework of IT skills that are required of students entering the profession as trainee accountants in South Africa. The IT skills framework as devised in chapter 2 is discussed in depth to develop a comprehensive framework of not only the critical IT skills, but also the techniques and tools that can be used in a South African business environment to ensure that accountants acquire these skills. The chapter concludes with a detailed IT skills framework that is suited to the South African business context.

Chapter 5: Analysis of current IT education at South African universities

This chapter addresses investigative question 4 (section 1.8.4) by evaluating the current IT training offered to students at South African universities. The programmes offered by South African universities for the training of accountants are analysed and compared to the IT skills framework that is developed in chapter 4 using literature review and document analysis. This comparison includes the content of the syllabus as well as the depth and delivery method of the syllabus by using material published by the respective universities. The chapter concludes with a discussion of the findings of the evaluation, identifying strengths in the current education and reasons for the existence of any shortcomings, and identifies factors that could address the shortcomings.

Chapter 6: Strategies for the implementation of the critical IT skills framework

Before strategies were identified and discussed to implement the IT skills framework, the perceptions of academics at South African universities on IT education were acquired using by means of an exploratory questionnaire. The chapter identifies and

discusses strategies that can be employed in the South African business environment to ensure that students entering the profession as trainee accountants are technologically competent.

Chapter 7: Conclusion and recommendations

A summary of the research problem, findings and recommendations concludes the research. Other areas that could be investigated in further research studies are also highlighted.

1.11 Conclusion

This chapter discussed the impact of IT on the accountancy professionaccounting profession and raised the question whether students that who have completed their education at South African universities have acquired the IT skills needed to be competent within the South African business environment. From the discussions in this chapter, it is evident that the competencies required from students by the business environment are not aligned with the competencies students currently acquire through the formal education process. This gap exists mainly because of the inability of various constituents (like some business organisations, professional accountancy bodies and education partners (including universities)) to adapt timeoeusly to changes in the business environment, as well as because of paradigm differences in how information technology is viewed by these constituents and individuals. This chapter concludes with a definition of the research problem, scope and approach that was followed in addressing the research problem.

In the next chapter a detailed literature review will beis conducted to define a set of IT skills that are generally accepted to be important for accountants to have.

Chapter 2
Critical IT skills required by professional accountants

2.1 Introduction

One of the objectives of accounting education at South African universities is to prepare students for positions as professional accountants (whether as chartered accountants registered with the South African Institute of Chartered Accountants, chartered management accountants registered with the Chartered Institute of Management Accountants, or certified accountants registered with the Association of Chartered Certified Accountants). The bulk of current education at South African universities focuses on equipping students with technical knowledge by means of courses or modules that focus on financial accounting (the recording of processes and activities according to generally accepted accounting principles), tax rules and laws, management accounting techniques and audit procedures. The body of knowledge that is being taught is prescribed mainly by the South African Institute of Chartered Accountants, the dominant professional accountancy body in South Africa. The success and appropriateness of these courses and programmes can be gauged by their ability to develop the technical skills and abilities of students.

The reputation, relevance and value of the accountancy and auditing profession depend on the ability of its members to meet the expectations of various stakeholders and to provide a service appropriate to the needs of the particular environment in which they operate.

As was discussed in the previous chapter, the environment in which professional accountants work changes constantly and is creating new demands on the accountancy profession. These changes also create new employer expectations regarding accounting graduates' skills and abilities. To be competitive and add value in this changing environment, professional accountants need to acquire the knowledge and skills they require to be relevant. The goal of accounting education should therefore be to produce students that are competent when starting with their traineeship accountants.

Professional bodies are responsible for setting qualification standards for the admission of candidates as members. Hence, employers and clients trust that such admission means that professional bodies are satisfied that their members are competent to work as professional accountants and to offer their services to the public (IFAC Education Committee, 2003b:8). To protect themselves against the long-term risk that the value of the qualifications they endorse will diminish, professional bodies therefore have an interest in defining what criteria are claimed to show competence and in demonstrating that their members meet these criteria.

The purpose of this chapter is to identify the information technology knowledge and skills that are prescribed by professional accountancy bodiesaccountancy bodies (see investigative questions 1 and 2, section 1.118.1). Ot Oherther relevant academic research that has been conducted is also discussed to evaluate whether the IT skills as prescribed by the professional accountancy bodiesaccountancy bodies are up-to-date, complete and relevant. The information technology skills are evaluated to determine those skills that are viewed as critical for professional accountants to have to be competent in their working environment.

A literature review of research by various professional accountancy bodiesaccountancy bodies and other stakeholders has been conducted to determine:

- the competencies that future professional accountants will need; and
- the impact of the changing environment on the curricula syllabi set by professional bodies.

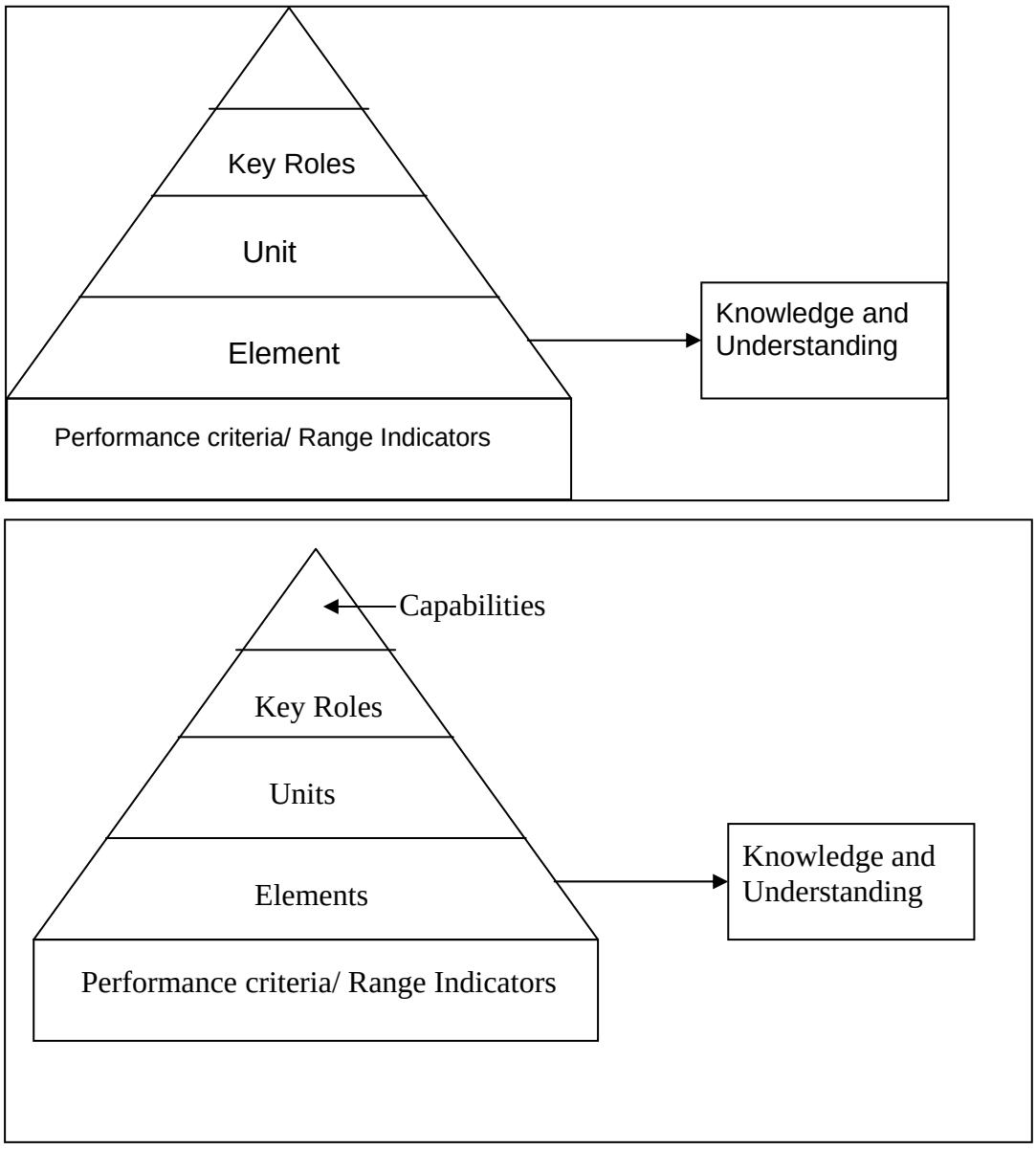
One of the key drivers of change in the accountancy environment is advances in information technologies. The chapter starts by presenting and discussing the relevant objectives that professional bodies use in setting their curriculasyllabi. Next, the impact of the IT environment on the curricula syllabi and competence of professional accountants is considered. The chapter concludes with a discussion and formulation of the IT skills that accountants must be competent in using. Before the impact of the environment on the curricula syllabi and competence of accountants is discussed, the framework and methodology as used by professional bodies to set their curricula syllabi are described.

2.2 Methodology

The objective of accounting education is to produce competent accountants (IFAC Education Committee, 2003b:10). In South Africa, the government has introduced new legislation dealing with education and training. This legislation includes the South African Qualifications Authority Act, Act 58 of 1995 (Republic of South Africa, 1995), which enacts the introduction of a National Qualifications Framework. The underpinning requirements of the framework are that all qualifications must be based on performance outcomes and that all competency-based standards must be drafted by the respective stakeholders in that particular discipline. The accountancy profession in South Africa has embraced these changes and is reforming all its accounting qualifications along competency lines (IFAC Education Committee, 2003b:16). The approach has been to follow the functional analysis route to include capabilities, as this was deemed best suited to incorporating the concepts of transferability, mobility and accessibility to the benefit of all prospective learners (IFAC Education Committee, 2003b:15).

A *functional analysis* starts with the key roles of professional accountants and breaks these down progressively into units and elements, together with their performance criteria. These make up statements of competence. Capabilities have been added at the top end and knowledge and understanding are listed as an adjunct. Together these define performance outcomes (IFAC Education Committee, 2003b:16). Figure 2.1 illustrates the functional analysis as a framework for a performance outcomes based approach.

Figure 2.1: Framework for functional analysis (IFAC Education Committee, 2003b:16)



Source: IFAC Education Committee (2003b:16)

As the functional methodology is used in South Africa to determine the curricula syllabi for professional accountants, this methodology will be used as the framework for the rest of the discussion in this dissertation.

2.3 Profile of future professional accountants

To investigate the profile of future professional accountants, professional bodies have appointed various committees. These include the authors of the Bedford Report (American Accounting Association,1986), the authors of the Big Eight Report (American Accounting Association, 1989), the Canadian Inter-Institute Vision Task Force, which began its work in 1994 (CICA, 1996), and the CPA Vision Project,

which started in 1998 (AICPA, 2000). These committees were tasked with conducting extensive research and analysis of these profiles. The findings of their research are briefly discussed below.

2.3.1 *The Bedford Report*

In 1986 the American Accounting Association funded the Bedford Report, which investigated future accounting education and resulted in plans to prepare for the expanding profession (American Accounting Association, 1986). In this report the committee foresaw "the continuing emergence of an accountancy profession which will provide information for economic and social decisions, using sophisticated measurement and communication technologies applied to a substantially enlarged scope of phenomena. Within this expanded profession, auditing and the attest function will continue to be important focal points, even as the levels of technical, conceptual, and human relations skills required to perform these functions continue to change" (American Accounting Association, 1986:1). Referring to the matter of information technology, the committee concluded that accountants who remained narrowly educated would find it increasingly difficult to compete in an expanding profession. The committee identified the following as important needs for the professional accountant:

- He/she must know how to design and diagnose comprehensive information systems for all types and sizes of organisations. A key indicator of the accountant's success will be the degree to which such systems and reports serve managers as well as external users. Knowledge of the general management of organisations will become progressively more important to the relative achievement and functions of accountants.
- Accountants must not only acquire and maintain high levels of competence, but must also continuously enhance these levels in order to meet expanding and increasingly diverse demands for services. Meeting such demands and marketing newly developed services offer opportunities and challenges. If accountants do not rise to these opportunities, individuals from other disciplines will provide the required services, thus narrowing the scope of accounting practice.

- Accountants must pursue lifelong learning as a means of adjusting to change. They should learn to adapt to the development and the use of increasingly complex information technologies.

2.3.2 *The Big Eight Report*

In 1989, the chief executives of the eight largest public accounting firms in America compiled a report on their perspectives on education (American Accounting Association, 1989). This report dealt specifically with the *capabilities* accountants need to practise. The Big Eight Report listed three skills (communication, intellectual and interpersonal skills) and three types of knowledge (general, organisational and business, and accounting and auditing knowledge) that are critical to professional career success. It also called for newer delivery techniques that stimulate student involvement.

The knowledge required for public accounting as identified by this report is:

- general knowledge (economic, political and social forces at work in the world);
- organisational and business knowledge (economic, social, cultural and psychological forces that affect organisations; methods for creating and managing change; attention to the current and future roles of *information technology* in client organisations and accounting practices); and
- accounting and auditing knowledge (strong fundamental understanding of accounting and auditing).

2.3.3 *Canadian Inter-Institute Vision Task Force*

In 1994 the Inter-Institute Vision Task Force was created to address the challenge of the future of the accountancy profession in Canada. The research found that by 1995, only 42% of members were in public practice. This percentage was predicted to decline to 30% by 2015. The Inter-Institute Vision Task Force came to the conclusion that the Canadian profession should meet the needs of its members in business, industry and government by including a broader range of business skills and disciplines in the training of accountants (CICA, 1996). The Vision Task Force identified three issues that impact on the Canadian CA profession:

- *information and communications technology* (speed, accessibility and access issues);
- globalisation; and
- alliances (establishment of appropriate alliances with other bodies to complement the profession's efforts to develop the knowledge and skills the profession needs, enhance the profession's understanding of market forces and leverage its initiatives and opportunities) (CICA, 1996).

2.3.4 *CPA Vision Project*

In 1996, the American Institute of Certified Public Accountants (AICPA) embarked on a major undertaking known as the CPA Vision Project. This project confirmed that CPAs have far more in common than they realise, regardless of where they practise the profession. The project resulted in the identification of the top five values, services, competencies and issues for the CPA profession in America as listed in table 2.1.

Table 2.1: CPA Vision Project

Core values	Core services	Core competency
Continuing education and life-long learning	Assurance and information integrity	Communication and leadership skills
Competence (high quality work in capable, efficient and appropriate manner)	Technology services (business application processes, systems integrity, knowledge management, systems security, integration of new business processes and practices)	Strategic and critical thinking skills
Integrity	Management consulting and performance management	Focus on the customer, client and market
Attuned to broad business objectives	Financial planning	Interpretation of converging information
Objectivity	International services	Technologically adept

Source: AICPA (2000:11)

This Vision Project recognised similar shifts in roles, responsibilities and skills for its members outside public practice, in the emergence of what it called “the new finance”. But it observed that “the skill sets of different segments of the profession are converging”, as CPAs in public practice are under pressure from clients “demanding more value from their outside accountants” (AICPA, 2000:20).

The findings of these committees have been included in the competence requirements set by the various professional accountancy bodiesaccountancy bodies. The International Federation of Accountants (IFAC) has also done extensive research on the future of professional accountants, resulting in the formulation of International Education Standards.

The profile of the future professional accountant is analysed below by discussing research conducted by accountancy bodies and IFAC, as well as other academic research.

2.4. Knowledge and competence requirements 3.1 *Profile set by accountancy bodies*

The requirements of a number of prominent professional accountancy bodiesaccountancy bodies were compared with respect to the capabilities (focusing on knowledge requirements and skills) for entering their profession. These bodies were the following: the Institute of Chartered Accountants in Australia (ICAA), the Canadian Institute of Chartered Accountants (CICA), the Institute of Chartered Accountants in England and Wales (ICAEW), the American Institute of Certified Public Accountants (AICPA), the New Zealand Institute of Chartered Accountants(NZICA), the South African Institute of Chartered Accountants (SAICA), the Chartered Institute of Management Accountants (CIMA), the Institute of Management Accountants (IMA) and the International Federation of Accountants (IFAC). The comparison is summarised in table 2.21.

All the specific requirements mentioned with regard to information technology knowledge and skills are highlighted in this table. These highlighted areas reflect the basic understanding of IT and information that is required. Most of the professional bodies have, however, integrated the application of technology and information into most of the other subjects that accountants study (for example, Business Management, Auditing, Risk Management, Business Applications). This move reflects the fact that the nature of IT is affecting almost all the activities performed by a professional accountant.

In the first part of table 2.21, the knowledge requirements set by the various professional bodies are grouped together according to professional subjects (general business environment, financial reporting, assurance and auditing, taxation and financial management). The second part of table 2.21 lists the various skills required by these accountancy bodiesaccountancy bodies.

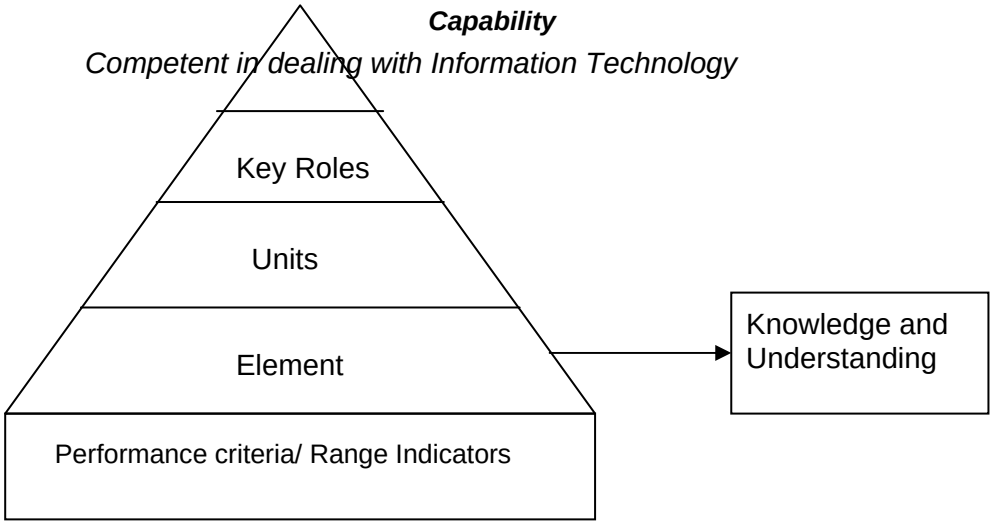
Table 2.21: Competence Knowledge and skills required by professional accountancy bodiesaccountancy bodies

	ICAA (2004)	**CICA** (2004)	**ICAEW** (2004)	**AICPA** (2004b)	**NZICA** (2006)
Knowledge	CA Foundation (Business knowledge, ethics, ***IT,*** *communication*) Financial reporting and assurance Taxation Strategic business management	Organisational effectiveness, control and & risk management ***Information and IT*** Finance Assurance Taxation Performance mmeasurement	Business environment (***including IT***) Business life-cycle Accounting Financial reporting Audit and assurance Taxation Business finance Business management	RRegulations (ethics, law); Financial analysis; Human resources; ***Information technology*** Financial accounting and reporting Internal auditing; control environment Taxation Cost management Budgeting, forecasting and business planning TTreasury management	Business-related study (***including IT***, law, economics) Accounting study (financial accounting, management accounting, auditing & taxation) General study
Skills	Innovative problem solving Forward-thinking change management; ***Technological literacy*** Collaborative team work Capable communication of shared understandings	Problem solving Management skills Adaptability to change ***IT skills*** Communication	 ***Business awareness*** Technical knowledge Professional judgement Communication	 Leadership skills Strategic and critical thinking skills ***Technological adeptness*** Communication skills	Academic ability in accounting subjects High standard of professional competence Professional and **technical** ability

	SAICA (2004)	**CIMA** (2004:2)	**IMA** (2004)	**IFAC** (2003b)
Knowledge	Supportive subjects ***Information technology*** External financial reporting Auditing Taxation Managerial accounting and financial management	Business strategy Organisational management and ***information systems*** Financial accounting and tax principles Financial analysis Risk and control strategy Financial strategy Decision management Integrated management Performance evaluation	Business applications (organisation management, communication, ethics, ***IT*** and behaviour) Business analysis Management accounting and reporting (budgets, cost, ***information management,*** performance management and financial reporting) Strategic management (planning, marketing, finance, decision making)	Organisational and business knowledge ***IT knowledge and competencies*** Accounting, finance and related knowledge
Skills	Communication skills Intellectual skills Interpersonal skills ***Information skills*** Professional values	Communication skills Consultative approach (team building/ teamwork, leadership) ***Manage information, apply technology*** Formulation of business strategies Risk management Commercial acumen Financial management skills Management accounting skills	Communication skills Team work Analytical skills Understanding of accounting Understanding of how a business functions	Personal skills Interpersonal and communication skills Intellectual skills Technical and functional skills (including ***IT proficiency***) Organisational and business management skills

It is clear from the knowledge part of table 2.21 that the subjects required by the various professional bodies correlate to a large degree. The deviations that occur relate to accounting bodiesaccountancy bodies that cater for niche areas of the accountancy profession (for example, CIMA and IMA focus on management accountancy). In the skills part of the table, it is clear that all the professional bodies require accountants to be technologically adept. The study of IT and information in the context of all the other knowledge subjects will also enhance other listed skills (for example, accountants' communication skills, problem-solving skills and business awareness). According to the methodology of functional analysis discussed in section 2.2 and the research discussed so far, one of the capabilities of professional accountants is that they should be competent in dealing with information technology.

Figure 2.2 Functional analysis regarding information technology



Most of the research discussed in this chapter forms the basis for the formulation of an internationally accepted standard for the education of professional accountants. In the following section the role of the International Federation of Accountants in formulating education standards that prescribe the contents of training future professional accountants is discussed.

*2.3.2**2.5*** **International Federation of Accountants (IFAC)**

The broad objective of the International Federation of Accountants (IFAC) is to develop and enhance a co-ordinated worldwide accountancy profession with harmonised standards. The Education Committee of IFAC was formed to develop pronouncements on both the prequalification (entry level) education and training programmes of accountants and on continuing professional education for members of the accountancy profession. This committee has issued several guidelines and other papers on education issues. This includes papers on the experience of the Certified General Accountants' Association of Canada on integrating information technology across their accounting curriculum (IFAC, 1995) and a discussion paper on the strategies employed by the American Institute of Certified Public Accountant in implementing information technology in the accounting curriculum (IFAC Education Committee, 1996). In June 2002, IFAC published an exposure draft containing the proposed *International Education Standard for Professional Accountants* (IFAC Education Committee, 2002). In 2003 the Education Committee of IFAC followed

this with the *International Education Standards* for professional accountants that establish the essential elements that education and development programmes are expected to contain for potential international recognition, acceptance and application (IFAC, 2003b:28).

Because of the wide diversity of cultures, languages, and educational, legal and social systems in the countries of member bodies and the variety of functions performed by accountants, the International Education Standards provide enough scope for each individual member body to determine the detailed requirements of their programmes. The mission of the Education Committee is to "serve the public interest by the world-wide advancement of education and development for professional accountants leading to harmonised standards" (IFAC, 2003b:4).

IFAC used research conducted by the various professional bodies together with research commissioned by IFAC (as discussed in section 2.3 and 2.4)) as the basis for formulating its education standards, coupled with accepting commentary from all the member bodies. Three different types of statements are issued by the Education Committee:

- *International Education Standards for Professional Accountants* (*IES*), which prescribe good practice in the education and development of professional accountants;
- *International Education Guidelines for Professional Accountants* (*IEG*), which provide guidance on how to achieve good practice; and
- *International Education Papers for Professional Accountants* (*IEP*), which discuss issues or present findings.

All IFAC member bodies are were expected to comply with *IES* from 1 January 2005 (IFAC, 2003b:26).

The International Education Standards for Professional Accountants prescribe the learning and development requirements for professional accountants under a number of Standards (*IES 1* to *IES 7*). *IES 2* prescribes the knowledge content of professional accounting education programmes as required for professional accountants. The primary knowledge part of the professional accounting programme

(IFAC, 2003b:42) consists of the following:

- accounting, finance and related knowledge;
- organisational and business knowledge; and
- IT knowledge and competences.

Accounting, finance and related knowledge provides the core technical foundation essential to a successful career as a professional accountant. The mix of topics may differ according to the sectors or locations in which individuals work, and member bodies are allowed to add topics, or alter the balance of their programmes to meet the needs of their particular environments.

Organisational and business knowledge provides information on the context in which professional accountants work and it includes details of how businesses are organised, financed and managed, and the global environment in which business operates.

Information technology has transformed the role of the professional accountant. The professional accountant not only uses information systems and exercises IT control skills, but also plays an important role in a team in the evaluation, design and management of such systems (IFAC, 2003b:45). (The effect of information technology on the education of accountants is discussed in the next section. IT skills required by professional accountants in order to be competent in their working environment are discussed in section 2.4 of this chapter.)

2.6 A3.3 Other academic research on the effect of IT on the education of accountants

Theuri and Gunn (1998:101-117) examined the way in which information systems courses have been designed and structured in American universities and then related these practices to the information systems skills expectations of the employers of accounting graduates. Their study indicates that employers have important preferences regarding the information systems curriculum for accounting students. They conclude from their results that there is a clear need to re-evaluate

the information systems content of undergraduate accounting information systems (AIS) courses.

Hostrom and Hunton (1998) argue that the assurance services provided by the auditing profession are changing, especially with regard to organisations that are conducting business in virtual reality. Upon close examination of the possible risks involved, the fundamental issue is that of control over information and related technology. They see the integration of information technology in curricula as a challenge to accounting educators, as the influence of information technology is increasingly permeating international practice. They argue that accounting educators and their students must either develop high levels of information technology competence or risk becoming functionally obsolete (Hostrom and & Hunton, 1998:352).

Coenenberg, Haller and Marten (1999) investigated the current state of accounting education for qualified auditors in Germany and identified challenges for that country

due to:

- changes in the accounting and auditing environment;
- the need for diversification from auditing and assurance services; and
- an enlargement of the scope of the statutory audit function.

Coenenberg, *et al.* (1999) found that current accounting education in Germany lagged behind international guidelines in terms of the breadth and depth of competence that Accounting should provide. The areas that they identified as underrepresented in the professional curriculum were Mathematics, Statistics, the Behavioural Sciences and *Information Technology*. On the basis of their study, Coenenberg, *et al.* (1999:388-387) identified the last two areas (the Behavioural Sciences and Information Technology) as becoming more important due to the challenges that the accountancy profession will have to meet in the future.

Boyse (2004) argues that current accounting education continues to be constrained within narrowly defined, but misconceived, disciplinary boundaries focusing on the techniques and “skills” of accounting practice. In his article, Boyse presents a case

for broadening the Accounting education curriculum to make Accounting education relevant in its socio-historical context and to the lived experience of students.

The underlying tenor of the evolution and the future business environment described in the surveys, research and reports discussed thus far suggests a number of structural changes that will make some aspects of business easier and cheaper. Howieson (2003:73) expects these forces to redefine the relationship between clients and professional experts, because more powerful technology will empower clients to play a bigger role in managing their own affairs. As a result, although many of the types of service that accountants have traditionally provided will still be needed (for example, records still need to be kept and audited), more businesses will be able to perform many procedural tasks themselves or outsource them to competitors of the accountancy profession.

Greenstein and McKee (2004) conducted a literature review that resulted in the identification of 36 critical information technologies. They then surveyed 1 000 accounting information systems and auditing academics and 1 000 audit practitioners in America to determine their self-reported IT knowledge levels and perceptions about the best places to learn IT skills. After having conducted a factor analysis, they found a relatively low level of knowledge of e-commerce and advanced technologies and audit automation constructs among both educators and practitioners, but a relatively high level of knowledge of office automation and accounting firm office automation constructs. They also identified a potential “learning gap” between educators and practitioners that may occur in five of the 36 critical technologies that they examined.

Noll and Wilkins (2002) conducted a study to determine the expected skills and knowledge required of information systems professionals in three general staffing groups (including end-users). The research shows that information systems knowledge relating to the entire organisation and overall business knowledge are important and that less emphasis should be placed on having skills to use advanced information system applications.

Arquero Montano, Donoso Anes, Hassall and Webber (2001) examined the importance that employers of management accountants put on skills (including information technology) and the level of skills exhibited by students. They concluded that some skills deemed important were underdeveloped (including IT skills) and that employers generally agreed with statements that the university should take workplace requirements into consideration when developing curriculum and course content.

Twining (1995) suggested goals for IT training which include that basic computer knowledge should be followed by software packages in support of business applications. There is a general recognition that students in higher education need to acquire IT skills and that these IT skills should include word processing, spreadsheets, graphics and databases (Rowley & Coles, 1996; Freeman & Rowley, 1995).

The various research findings discussed in this section suggest that advancements in communications and e-commerce mean that all businesses could potentially face a global marketplace. This presents more business opportunities for organisations, but it also increases the competition that any particular organisation must face. Technological improvements in data management will mean that the average business person will become more sophisticated and educated and thus more self-reliant than he/she is at present. As Albrecht and Sack (2001:6) have noted, the forces of change “have eliminated the old model that assumed information is expensive. Today anyone, armed with the right software, can be an ‘accountant’ and produce financial information”. The problem for the business person then becomes what to do with all the information and how to avoid information overload. The opportunity that arises for the accountancy professional is to add value for the client/employer by analysing and interpreting that information and providing recommendations for appropriate courses of action (Howieson, 2003:75).

2.7 4 The IT skills required by of professional accountants

The IT skills that professional accountants need are discussed by analysing the requirements set by the International Education Standard (*IES 2*) and other relevant academic research that will be discussed in this section..

2.74.1 *International Education Standard (IES 2) and International Education Guideline 11 (IEG 11)*

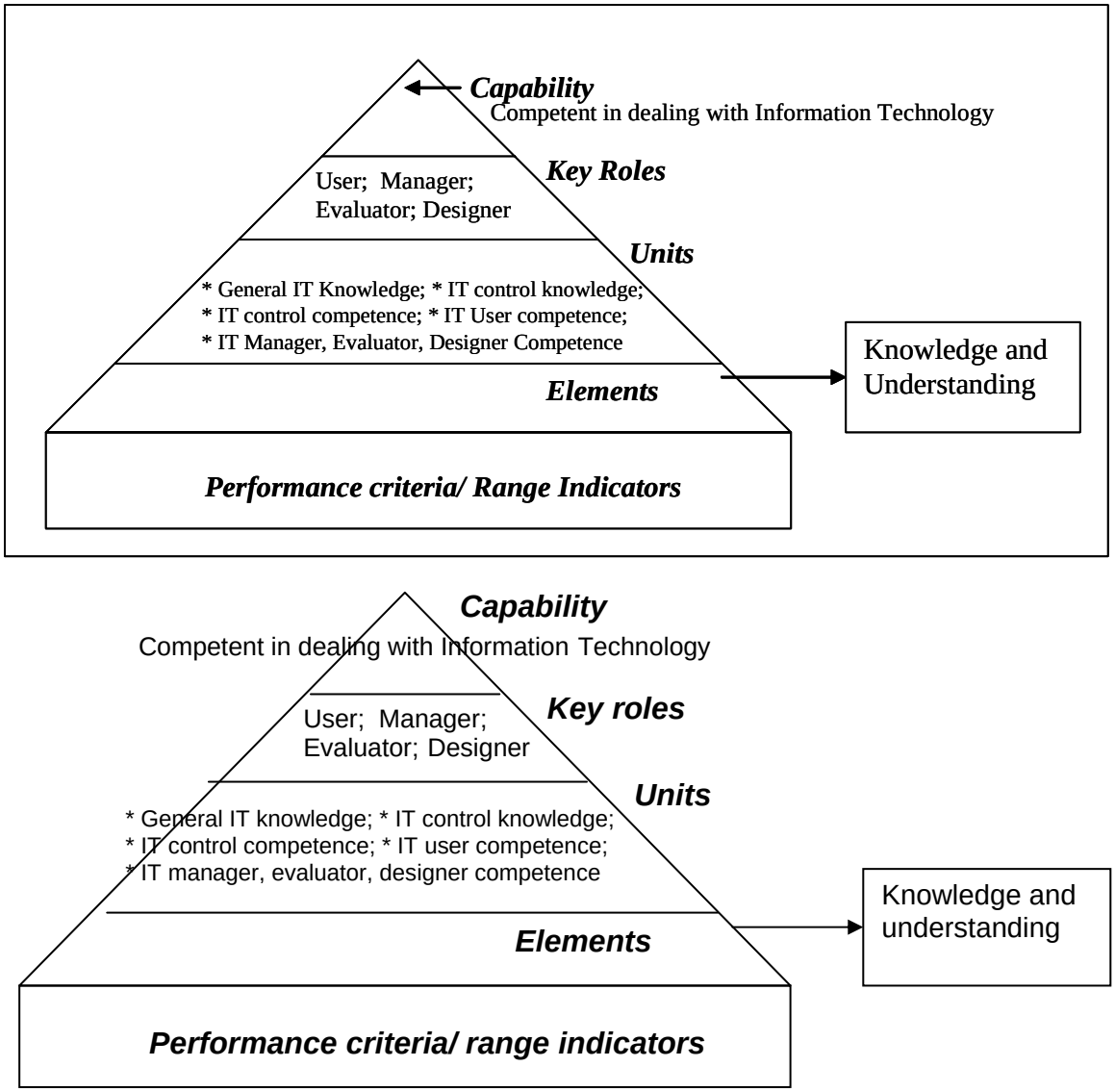
According to *IES 2*, the information technology component should include the following subject areas and skills:

- general knowledge of IT;
- IT control knowledge;
- IT control competences;
- IT user competences; and
- one or a mixture of the competences of the roles of manager,; evaluator or designer of information systems (IFAC, 2003b:33).

Guidance in information technology knowledge and competences for professional accountants is set out in *IEG 11*. As part of their prequalification education, all professional accountants are expected to act as managers, designers or evaluators of information systems or to take on a combination of these roles as identified in *IEG 11* (IFAC, 2003b:49). This Guideline was developed by the Education Committee of IFAC with Boritz (2003) responsible for coordinating the research to provide guidance to member bodies on developing programmes to enhance the IT competence of their present and future members. It was first issued in 1985 and was revised in 1998 and 2002. During this revision process, interested parties were asked to comment on this Guideline. IFAC's Education Committee then reviewed the comments submitted by IFAC member organisations, academics and others and made changes to the Guideline before releasing it as part of the Education Standards (IFAC Education Committee, 2003a).

The requirements for IT knowledge and skills are summarised in figure 2.23, using the functional analysis methodology as discussed in section 2.2 and integrating the requirements for information technology according to *IEG 11*..

Figure 2.23: Detailed functional analysis for information technology



The part of *IEG 11* that refers to the acquisition of knowledge could best be covered through formal lectures and sessions during which the required material is studied. Those parts of the syllabus guideline that refer to the acquiring of skills, however, require that the accountant student be able to **perform** that function to a defined standard, with reference to real working environments. This would require educators

of accountants to make use of practical training sessions where the accountant student is exposed to the real working environment in which that accountant student will most probably function in future. This typical working environment may be different in different countries and sectors/industries within a given country. In order to develop these skills, educators will need to be aware of the typical future working environment of the accountants students they are training educating and will have to apply this knowledge in conducting practical training sessions.

Knowledge can typically be obtained through formal lectures in which the required material is covered. To obtain the required IT skills, the accountantstudent, however, must be able to perform these skills in a business environment. One of the main interactions of accountants with information technology is as users. Accountants Students should have the necessary IT skills to be able to use information systems and technology efficiently to perform their various tasks as accountants (including financial reporting, taxation, management accounting or auditing).

IEG 11 refers to the IT knowledge and skills required by accountants. As the focus of this research is on the IT skills required, *IEG 11* was analysed to identify all the references to information technology skills. Table 2.32 contains a list of all the IT skills mentioned in *IEG 11*, together with a reference to the source of where the IT skill was identified.

Table 2.32: Information Technology skills as required by *IEG 11*

	Information Technology Item	*IEG 11*
1	Computer-assisted audit techniques (to evaluate information system processing operations and controls and to analyse and evaluate monitoring processes and activities)	IT control and evaluator role skills
2	Operating systems	User role skills

3	Word processing (in a relevant accounting// business context)	User role skills
4	Spreadsheet software (in a relevant accounting/ business context)	User role skills
5	Database software (in a relevant accounting/ business context)	User role skills
6	Internet tools (e-mail; web browser, FTP) (in a relevant accounting/ business context)	User role skills
7	Professional research tools (in a relevant accounting/ business context)	User role skills
8	Business presentation software (in a relevant accounting/ business context)	User role skills
9	Anti-virus software and other security software (in a relevant accounting/ business context)	User role skills
10	Utility software and other relevant software (in a relevant accounting/ business context)	User role skills
11	Accounting packages	User role skills
12	E-business systems (ERP, CRM and business automation systems)	User role skills
13	Networks (LAN)	User role skills
14	Electronic commerce (B2C, B2B, encryption tools, digital signatures/ certificates, key management)	User role skills
15	Back-up and recovery	User, manager role
16	Outsourced services (Internet Service Providers, Application service providers)	Manager role skills
17	EDI and e-commerce activities	Manager role skills
18	Access controls (logical and electronic)	Manager role skills
19	Communication	Manager, designer and evaluator role skills
20	Document design specification	Designer role skills
21	Testing of system	Designer and , manager role skills

22	Planning of system evaluation	Evaluator role skills

Source: Adapted from IFAC Education Committee (2003a)

These IT skills require accountants to be able to apply their skills in relevant accounting and/or business contexts, not only as users of IT, but also as managers, evaluators, designers and controllers of the IT function. Although the information contained in table 2.32 covers all the IT skills required by an professional accountant, it is very vague and it does not address the issue of **how** accountants students can/should obtain these skills. In the next section, other research that has been conducted will be discussed to compare the IT skills as identified by IFAC and to gain insight into how these skills can be obtained.

2.74.2 *Critical IT skills – other international researchers*

Greenstein and McKee (2004:216), in a detailed literature search, identified 36 critical IT skills relevant for assurance practitioners in America. In their research, Greenstein and McKee (2004) only focused on the accountant as an evaluator of information systems and not on the managerial and designer roles as identified by IFAC in *IEG 11*. Researchers such as Theuri and Gunn (1998) have focused on designing, evaluating and updating the accounting information systems courses at undergraduate level by examining current practices in the design and teaching of the AIS courses at American universities and colleges. Their research revealed that job requirements in accounting firms and of corporate employers were the main factors that influenced AIS course content, with the CPA examination requirements as the other main factor (Theuri & Gunn, 1998:111).

Naqvi (2004) investigated the use of an Information Systems Approach (ISA) and Traditional Approach (TA) on the acquisition of IT competence of undergraduate students taking an introductory IT course in business colleges in America. The ISA approach begins with the conceptual understanding of business activities followed by the introduction of databases, spreadsheets and word processing in line with the IT applications used in business activities. The TA approach begins

with the conceptual understanding of business activities (like ISA approach) but followed by modules in sequence of word processing, spreadsheets and then databases. Naqvi (2004) concluded that the ISA approach is more effective in enhancing IT competence in undergraduate students that will enhance the students' information handling skills.

The research conducted by Greenstein and McKee (2004) focused on the accountant as an assurance practitioner. IFAC (1998) launched a series of articles that focused more on the accountant in his/her managerial function. This collection of articles addresses the main information technologies and their existing management accounting applications. Somers (Australia) (as cited in IFAC, 1998:3-21) has described a strategic and holistic view of "enabling information technologies" (for example, artificial intelligence, intranets, the internet, online analytical processing, data mining and data fishing), their current uses, and potential applications. These technologies, Somers pointed out, should be recognised as a new set of tools capable of re-engineering management accounting processes. He reviewed the state of the art of IT, and the likely future requirements of the 21st century's virtual accountant.

Delmond and Lebas (France) (IFAC, 1998(as cited in IFAC, 1998:23-33) have argued that management accountants have historically been constrained in their main role of supporting decision making by the lack of appropriate information technology tools. However, recent developments in information technologies have increased the quantity of financial and non-financial data that can be accessed, as well as the scope and speed of data analysis and transmission. These expanded capabilities significantly enhance the role of management accountants. Management accountants, with computer and IT specialists, should lead a dialogue aimed at linking the designs of systems with their desired managerial applications.

Grenier and Lebas (France) (IFAC, 1998(as cited in IFAC, 1998:33-46) have emphasised the transition of management accountants from the management of information to the management of knowledge. The combined effects of emerging IT technologies and managerial demands drive this evolution. A new generation of

software systems facilitates the translation of strategy into operations, overviews of performance, and organisational learning processes. As a result, Grenier and Lebas see management accountants of the 21st century as being heavily involved in designing, building and controlling information management tools and systems.

Bentley (United Kingdom) (IFAC, 1998(as cited in IFAC, 1998:76-85) relies on two cases in retail and insurance to illustrate the effects on management accountants of rapid and significant changes in (a) the *nature* of information; (b) the *use* of information; and (c) the *way* people relate to information. Dialogue with other people and systems will replace most printed information. Raw information will evolve into frequently updated patterns whose implications will be inferred by systems responding in dialogues. Widespread online accessibility to information will promote open management. Routine decisions will be taken over by systems, freeing managers to focus more on strategic planning, less on current operations. Beyond being informed, knowing what to do with the information will matter the most.

Hoffman (United States) (IFAC, 1998(as cited in IFAC, 1998:89-94) has discussed data warehouse creation opportunities suitable for small and medium-sized enterprises. Data warehouses can deliver essential and urgent decision support data to managers much more rapidly and effectively than traditional systems can. The best kinds of data warehouses are often generic applications customised by users. The creation of data warehouses typically relies on technology already present in many small businesses, and can be implemented internally through simple and inexpensive small-scale prototypes. Step-by-step implementation and reliance on demonstration models are recommended. Data warehouses are powerful tools in competitive and dynamic environments where easier access to critical data is essential for success. Since existing accounting systems already contain the ingredients of such data, management accountants are well suited to be major players in data warehouse creation and use.

It is evident from these articles that most researchers see management accounting as undergoing fundamental changes mainly because of the effect of technology on what accountants do and how they do it. Many of them fear that a failure of

accountants to respond to the changing environment and theyir not being competent in using technology is likely to diminish the influence of the accountancy profession on, and erode the value of, its contributions to the management and control of business enterprises. Most authors therefore urge management accountants to prepare themselves to assume key roles in the design, engineering and use of information technologies to manage information and knowledge effectively.

2.7.3 *Critical IT skills – South African research*

An extensive literature search was conducted to identify relevant research on the IT skills required of accountants operating in the South African business environment. The only study that could be used was research conducted by Prinsloo (2004) that attempted to elucidate the concept of competence by focusing on ways in which the professional competence requirements of entry-level professional accountants could be ascertained, described and assessed. No other relevant research was identified.

2.74.43 *Integrated list of IT skills*

The critical IT skills identified by Greenstein and McKee (2004), *IEG 11* (IFAC Education Committee, 2003a), and the other research that has been discussed, are summarised in table 2.43 to form a comprehensive list of critical skills required by professional accountants. The list of critical IT skills is divided into various categories that depict the specific skills that are required by an accountant to perform his/her job (IFAC Education Committee, 2003a), namely:

- the accountant as a user of technology in performing daily business and office tasks;
- the accountant conducting assurance testing using technology or evaluating technology (audit automation skills); and
- the accountant interacting with new and changing technology as a manager, user and designer of this technology.

Table 2.43 lists the various IT skills (identified as elements) together with an explanation of what the accountant should be able to do on acquiring that skill (capability). The source(s) indicating where the skills were identified is (are) shown in the last column.

Table 2.43: Comprehensive list of critical IT skills

CRITITAL IT SKILLS		
The accountant as a user of IT: Business automation skills		
Element	**Capability**	**Source**
Operating systems	Apply operating systems and utility software in a business/accounting context	IFAC Education Committee (2003a) Theuri & Gunn (1998)
Word processing	Apply word processing software in a relevant accounting/business context	IFAC Education Committee (2003a) Greenstein & McKee (2004) Theuri & Gunn (1998)
Spreadsheets	Apply spreadsheet software in a relevant accounting/business context	IFAC Education Committee (2003a) Greenstein & McKee (2004) Theuri & Gunn (1998)
Presentation software	Apply presentation software in a relevant accounting/business context	IFAC Education Committee (2003a) Greenstein & McKee (2004) Theuri & Gunn (1998)
Internet tools	Apply internet tools in a relevant accounting/business context	IFAC Education Committee (2003a) Greenstein & McKee (2004) Theuri & Gunn (1998)
Research tools	Apply professional research tools in a relevant accounting/ /business context	IFAC Education Committee (2003a) Greenstein & McKee (2004)
Image processing software	Apply image processing software in a relevant accounting/business context	Greenstein & McKee (2004)
The accountant as a user of IT: Office management skills		
Element	**Capability**	**Source**
Database software	Ability to design and use database systems	IFAC Education Committee (2003a) Greenstein & McKee (2004) Theuri & Gunn (1998)
Database search and retrieval	Ability to search and retrieve data from a database	IFAC Education Committee (2003a) Greenstein & McKee (2004)
Accounting software	Ability to understand workings of an accounting package	IFAC Education Committee (2003a) Greenstein & McKee (2004) Theuri & Gunn (1998)
Tax return preparation software	Ability to use tax return preparation software to capture and record	Greenstein & McKee (2004)

	relevant information	
Time management and billing systems	Ability to use time management and billing systems that assist the professional in capturing, managing, billing and reporting time spent on professional duties	IFAC Education Committee (2003a) Greenstein & McKee (2004)
Knowledge work systems (for example, groupware; workflow systems; expert systems)	Ability to work with knowledge work systems to aid accountants in the creation, integration and communication of knowledge	IFAC Education Committee (2003a) Greenstein & McKee (2004)
The accountant as a user and evaluator of IT: Audit automation skills		
Element	**Capability**	**Source**
Electronic working papers	Ability to use software that can generate trial balances and lead schedules for the recording of evidence in the audit	Greenstein & McKee (2004)
Audit software	Ability to use audit software to access client computer files, extract relevant data and perform audit functions	IFAC Education Committee (2003a) Greenstein & McKee (2004)
Test data	Ability to generate and use test data to test a computer application	IFAC Education Committee (2003a) Greenstein & McKee (2004)
Simulation software	Ability to create simulation modules in order to evaluate the logic of a computer application	Greenstein & McKee (2004)
Flowcharting/ /data modelling	Ability to use software that uses the source code version of an application to produce flowcharts of the program logic	IFAC Education Committee (2003a) Greenstein & McKee (2004)
Audit modules	Ability to use embedded audit modules (including real-time audit modules) that are incorporated into an application program	IFAC Education Committee (2003a) Greenstein & McKee (2004)
The accountant as a manager, designer and evaluator of IT		
Element	**Capability**	**Source**
Computer-aided systems engineering tools	Ability to use computer–aided systems engineering tools in designing new accounting systems or spreadsheet models	IFAC Education Committee (2003a) Greenstein & McKee (2004)
Client/server	Ability to function in a cooperative	IFAC Education Committee (2003a)

environment	client/server environment using local area networks	Greenstein & McKee (2004)
Electronic data interchange	Ability to perform EDI (traditional and web-based) transactions	IFAC Education Committee (2003a) Greenstein & McKee (2004)
Digital communications	Ability to understand digital communications (including wireless communications)	IFAC Education Committee (2003a) Greenstein & McKee (2004)
Network configurations	Ability to understand various network configurations (internal & external)	IFAC Education Committee (2003a) Greenstein & McKee (2004)
Application service providers	Ability to understand the issues around the management of application service providers	IFAC Education Committee (2003a) Greenstein & McKee (2004)
Internet service providers	Ability to understand the issues around the management of internet service providers	IFAC Education Committee (2003a) Greenstein & McKee (2004)
Anti-virus software	Ability to understand the use of anti-virus software to protect computer systems from infection	IFAC Education Committee (2003a)
Encryption software	Ability to understand the use of encryption software to change data, using some type of encoding/ /decoding algorithm	IFAC Education Committee (2003a) Greenstein & McKee (2004)
Firewall software/hardware	Ability to understand the use of security technology to enforce an access control policy between networks	Greenstein & McKee (2004)
User authentication	Ability to understand the use of software and devices to identify system users	IFAC Education Committee (2003a) Greenstein & McKee (2004)
Intrusion detection and monitoring	Ability to understand the use of security technology to identify unauthorised requests for services	Greenstein & McKee (2004)
Back-up and recovery	Ability to understand the use of technology for back-up and recovery procedures to ensure continuity of IT services	IFAC Education Committee (2003a)
Agent technologies	Ability to understand the use of programmed modules that are given certain levels of authority/ /autonomy to act on behalf of a supervisor	Greenstein & McKee (2004)
Data warehousing and	Ability to understand the use of data	IFAC (1998)

data mining	warehousing and extracting trends and patterns using data mining techniques	

This table is a comprehensive list of IT skills compiled from the research that was used, as was discussed in section 2.4 this chapter. A student who wishes to enter the accountancy profession should be able to demonstrate competence in the IT skills listed in table 2.43. The list of comprehensive IT skills can be used by institutions that educate professional accountants (for example, professional accountancy bodiesaccountancy bodies (SAICA, CIMA, ACCA), universities and training firms) in compiling their syllabi curricula for the training education of their students with regard to technology. According to the literature review undertaken for this research, such an approach will ensure that accountants entering the profession will be competent in using technology.

However, the list in table 2.43 does not describe the IT skills in sufficient detail and depth to apply it, as it is, in practice. Additional elements that need to be addressed include the relevance of each of the IT skills, the level of competence required for each IT skill, the tools/techniques that can be used to learn the skills and detailed information about each of these skills. Further research will be conducted to elaborate on the contents of table 2.43 to include the above elements.

2.85 Conclusion

The research conducted to investigate the skills and abilities that professional accountants will need in future emphasises the importance of understanding and being competent in the use of information technologies. IT is seen as one of the key drivers in changing the business environment, because it is integrated into almost all aspects of business. Whether professional accountants function as financial managers within a specific organisation, act as independent evaluators of the financial information and systems of organisations or act as consultants advising organisations, they will have to interact with and be knowledgeable about information technology to enable them to perform their jobs competently.

IFAC acknowledges the importance of information technology in the training of professional accountants, as is evident in the International Education Standards and

the guideline on information technology. The guideline on information technology (*IEG 11)* is prescriptive concerning the contents of information technology training,education, although it acknowledges that some member bodies might adopt different approaches to education in the IT area in the light of their own particular circumstances. Recognising that further developments in IT will not wait on the profession, the guideline advises each member body to review the guideline and consider how it can best address the recommendations. Therefore the guideline recommends that member bodies apply it in a manner that best suits the education and training environment for professional accountants in their respective countries. Because many of the education requirements involve practical skills and competences as listed in *IEG 11*, it could be best met through a combination of formal education (as supplied by universities) and a practical application of skills in a professional work environment (work place training).

The current IT syllabi as prescribed by professional accountancy bodiesaccountancy bodies are prescriptive on the IT knowledge required from accountants but are brief and very vague on the specific IT skills that accountants need. The SAICA's syllabus for information technology (SAICA, 2005c4:173105/053) contains the same vagueness and conciseness when referring to IT skills (as displayed in table 2.54).

Table 2.54: Extract from SAICA's IT syllabus

Units	Elements
Use IT systems/tools relevant to business/accounting	Use operating system (Windows, Other)
	Use word processing software
	Use spreadsheet software
	Use database software
	Use Internet tools (E-mail, Web Browser, FTP, Other) software
	Use professional research tools
	Use business presentation software
	Use anti-virus and other security software
	Use utility software and other relevant software
Apply controls to	Ensure processing integrity of IT resources

	Ensure security and safeguarding of IT resources
	Ensure availability/continuity provisions (back-up and recovery) for IT resources

Units	Elements
Use IT systems/tools relevant to business/accounting	Use operating system (Windows, other)
	Use word processing software
	Use spreadsheet software
	Use database software
	Use internet tools (e-mail, web browser, FTP, other) software
	Use professional research tools
	Use business presentation software
	Use anti-virus and other security software
	Use utility software and other relevant software
Apply controls to personal system	Ensure processing integrity of IT resources
	Ensure security and safeguarding of IT resources
	Ensure availability/continuity provisions (back-up and recovery) for IT resources

Source: SAICA (2005c:173/05)

This chapter aimeds to expand on these shortcomings by providing a list of critical information technology skills required by accountants entering the profession as identified by means of a literature review. These skills were identified without considering a specific environment in which such skills could be applied. To apply this list of skills to the South African environment, it is vital that the environment in which South African accountants operate should first first be investigated. Once the South African business environment is understood, the comprehensive IT skills as identified in table 2.43 can be adapted to ensure that the training education of professional accountants provides accountants with the capabilities and skills needed for the South African working environment.

In the next chapter the South African accountancy profession and business environment will be investigated to determine the information technology tools used by South African businesses that will be used by accountants functioning in the South African business environment.

Chapter 3
South African business and IT environment

3.1 Introduction

The importance of including information technology concepts in the training of professional accountants was discussed in the previous two chapters. The International Federation of Accountants has developed a framework for the inclusion of these IT concepts and member bodies have been required to comply with this framework since 1 January 2005. The framework (*IEG Guideline 11*) allows individual member bodies to adapt this framework and decide on how best to implement it to suit the specific environment of that member body. The framework, as determined by Guideline 11 *IEG 11*, does not identify the detailed critical IT skills needed by accountantsstudents, nor how it can be taught to these students. In chapter 2, *Guideline IEG 11* was used together with other relevant research to determine the critical IT skills required of professional accountants at the point of entry into the profession (table 2.43). To acquire the IT skills, students are required to perform the skills in a business and/or accounting context. As South African universities traineducate accountantsstudents for the South African environment, the IT skills need to be performed by students using in a South African business and/or accounting context.

This chapter addresses investigative question 2 3 (section 1.118.2) to determine the nature and demands of the South African business and information technology environment in which accountants will function. This analysis will identify the context within which IT skills are applied by accountants. The question will be addressed by analysing the nature of the accountancy profession in South Africa as well as the nature of the business environment in South Africa regarding the use of information technology. If an understanding is gained of the environment the accountant student will encounter on entering the profession as a trainee accountant and as a qualified professional accountant, the IT tools that the accountant will most probably use can be determined. These IT tools can then be used when students are trained educated

to ensure that they acquire the critical IT skills within an appropriate business environment.

This chapter will firstly investigate the South African accountancy profession and business environment and then analyse the information technology used by South African organisations to compile a profile of the typical IT environment accountantsstudents will encounter when entering the profession in South Africa as trainee accountants. The approach to this investigation is not to conduct a detailed study of the South African business environment, but rather to identify the typical environment students will encounter on completion of their formal education and on entering the business environment as trainee accountants. This investigation will identify those IT skills that are important for most students to possess to be competent in using IT in the South African business environment as well as to identify the IT tools most frequently used by South African organisations.

3.2 The South African business environment

Accountants apply their skills and knowledge within a specific environment. The training education of accountants accounting students in South Africa aims to provide competent accountants for the South African business environment. The South African business environment will be discussed by investigating the professional accountancy profession in South Africa together with the general business environment in which accountants will most likely operate.

3.2.1 *Accountancy profession in South Africa*

The three major professional accountancy bodies in South Africa are:

- South African Institute of Chartered Accountants (SAICA);
- Chartered Institute of Management Accountants (CIMA); and
- Association of Chartered Certified Accountants (ACCA).

The membership (of accountants currently working in South Africa) of the various professional accountancy bodies in South Africa is reflected in table 3.1.

Table 3.1: Membership statistics of accountancy bodies in South Africa

Accountancy body	Membership	Percentage
SAICA (2005a)	18 142	93%
CIMA (2005)	1 170	6%
ACCA (2005)	174	1%
TOTAL	**19 486**	**100%**

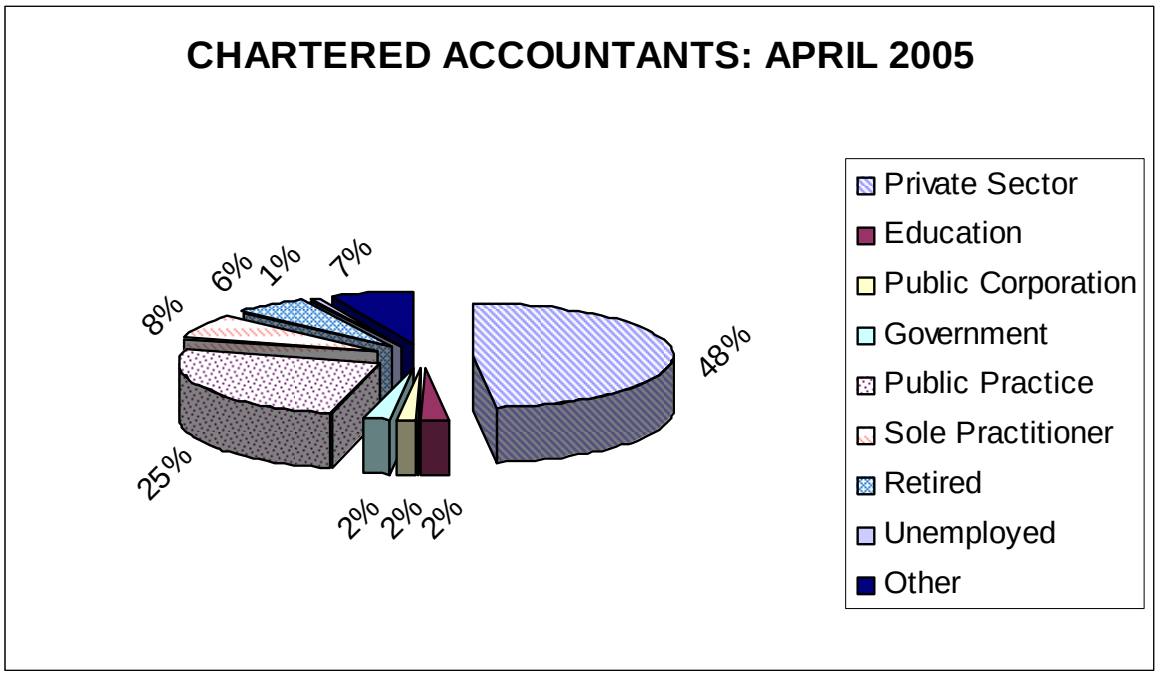
From the statistics in table 3.1 it is evident that SAICA members dominate the accountancy profession in South Africa, with 93% of all professional accountants working in South Africa being members of this professional body. The rest of this section will therefore focus on the profile of SAICA members.

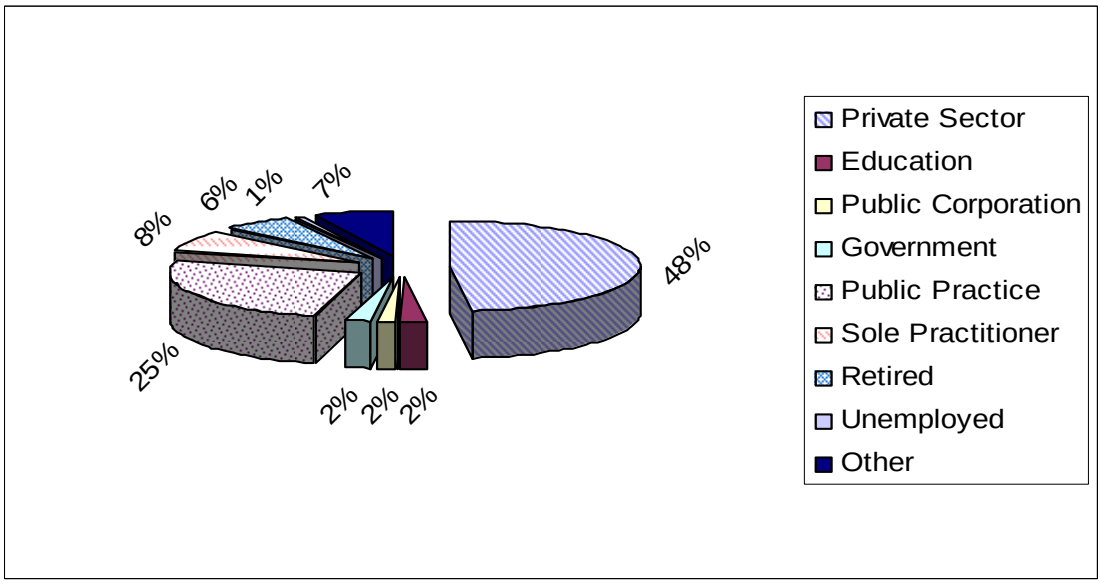
3.2.1.1 South African Institute of Chartered Accountants (SAICA)

The South African Institute of Chartered Accountants (SAICA) is the premier accountancying body in South Africa and was formed in March 1980, although its predecessor, the Institute of Accountants and Auditors, was formed initially in 1894 (SAICA, 2003a). SAICA is regulated by the Public Accountants' and Auditors Board.

According to SAICA's statistics about where chartered accountants work, 48% of all qualified accountants work in industry and commerce as financial accountants, internal auditors, financial managers, general managers and directors, with 25% of accountants working in public practice, as indicated in figure 3.1 (SAICA, 2005a).

Figure 3.1: Work roles of cWhere do chartered accountants work?s in South Africa: April 2005





Source: SAICA (2005a)

During the period January 2002 up to April 2005, SAICA had a growth in new chartered accountants of 16,9% that are working in South Africa. There was quite a substantial growth in the number of CAs working in the public sector (a doubling in the number of accountants). Table 3.2 gives an indication of the total number of qualified chartered accountants working in the different constituencies in South Africa

and highlights the diverse roles accountants perform in the South African business environment.

Table 3.2: CAs working in South Africa (SAICA, 2005a)

CONSTITUENCIES OF SAICA AS AT 5 APRIL 2005				
Private sector			**8 733**	**48%**
Financial Accountant	1 748	9,6%		
Branch Accountant	11	0,1%		
Financial Support Staff	204	1,1%		
General Management – Director	1349	7,4%		
General Management – Other	1133	6,2%		
Internal Auditor	385	2,1%		
Management Accountant	351	1,9%		
Senior Financial Manager – Director	1 453	8,0%		
Senior Financial Manager – Other	1991	11,0%		
Treasury Accountant	108	0,6%		
Education			**391**	**2%**
Public corporation and Government			**628306**	**32%**
Accountant	79	0,4%		
Auditor	46	0,3%		
Other	181	1,0%		
Government			**322**	**2%**
Accountant	89	0,5%		
Auditor	144	0,8%		
Other	89	0,5%		
Public practice			**4 598**	**25%**
Partner - large practice	642	3,5%		
Partner - medium practice	408	2,2%		
Partner - small practice	1 030	5,7%		
Employed - large practice	1 640	9,0%		
Employed - medium practice	640	3,5%		
Employed - small practice	238	1,3%		
Sole practitioner			**1 383**	**8%**
Retired			**1 068**	**6%**
Unemployed			**109**	**1%**
Other			**1 232**	**7%**
Total			**18 142**	**100%**

Source: Adapted from SAICA (2005a)

While specific needs and opportunities vary in the different constituencies, as displayed in table 3.2, those aspects of IT that are common between the various constituencies should be determined. In refining the IT skills framework (table 2.3table 2.4), those IT elements that all chartered accountants will be expected to

share should be emphasised, while those skills used by only a small percentage of accountants could be downscaled. In chapter 4 the IT skills framework will be refined, taking into consideration the various roles accountants perform in the South African business environment.

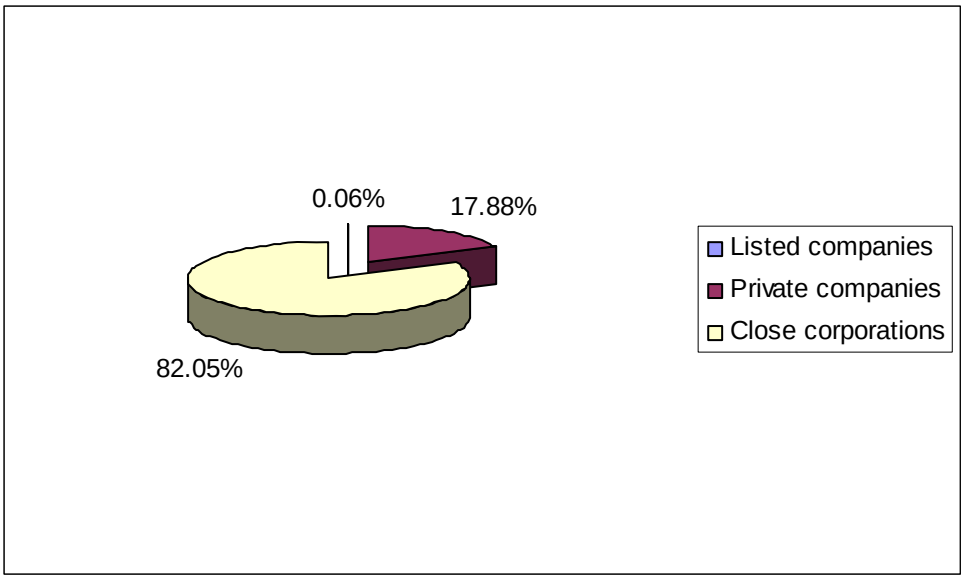
In the next section the general business environment in which accountants will operate, is discussed.

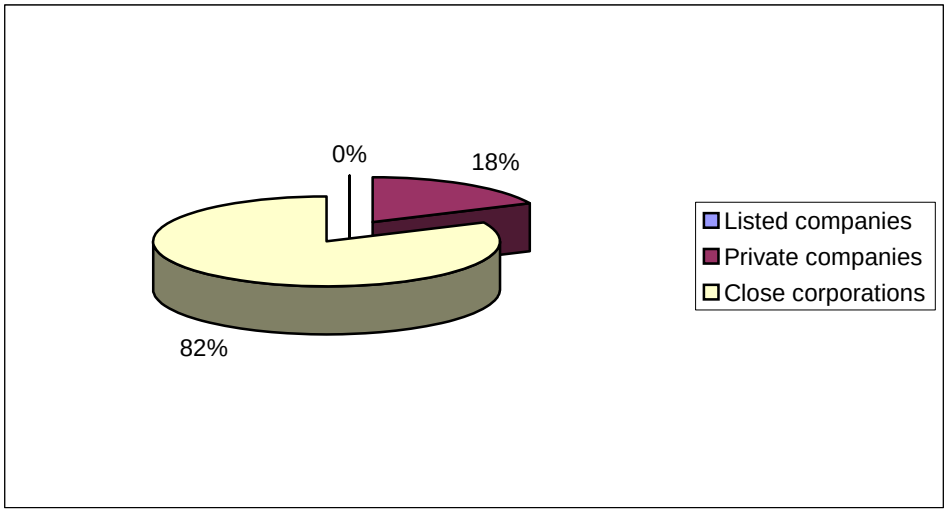
3.2.2 *General South African business environment*

The most common forms of businesses in South Africa are listed companies, private companies, branches of foreign corporations, close corporations, partnerships, joint ventures and sole proprietorships. As was mentioned in section 3.2.1, 48% of accountants will probable be employed by one of these business forms as accountants, while 33% of accountants (working in public practice and as sole practitioners) will be engaged in the auditing of the accounts of these business forms.

At the beginning of 2004, 426 companies were listed on the Johannesburg Securities Exchange of South Africa (compared to 650 in 1999), with a combined market capitalisation amounting to R1,8 billion (Johannesburg Securities Exchange, 2003:19). As is depicted in figure 3.2, the majority of business forms (99,9%) in South Africa are private companies (120 700 as at the end of August 2002) and close corporations (553 900 as at the end of August 2002) (Department of Trade and Industry, Republic of South Africa, 2002:48). No specific statistics are available on the number of partnerships or sole proprietorships, as they are not required to register their business form. A summary of the number of businesses per business form is highlighted in figure 3.2.

Figure 3.2: Number of businesses per business form



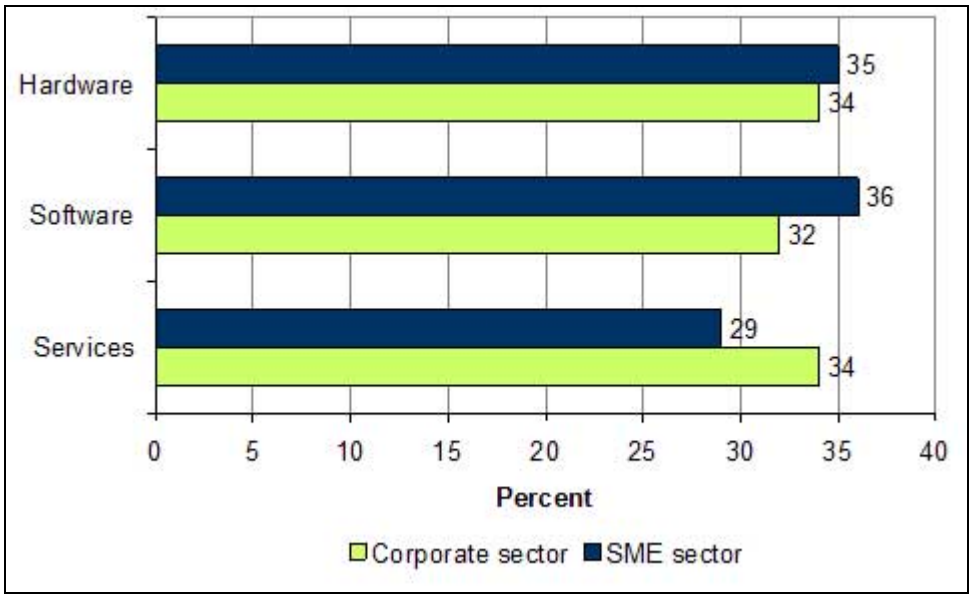


As is evident from figure 3.2, the majority of business forms (99,9%) in South Africa are private companies (120 700 as at the end of August 2002) and close corporations (553 900 as at the end of August 2002) (Department of Trade and Industry, Republic of South Africa, 2002:48). No specific statistics are available on the number of partnerships or sole proprietorships, as they are not required to register their business form. Within this group of business forms, investment in information technology is having a major impact on the competitiveness of these businesses, as was indicated by a survey conducted in 2003 by World Wide Worx (2003). More than 5 900 small to medium-sized enterprises (SMEs) were interviewed on their investment in IT.

Among the key findings of the survey was that small and medium-sized enterprises are spending a higher proportion of their turnover on IT each year. In 2001, 47% of SMEs spent more than 1% of turnover on IT, in 2002 48%, and in 2003 49% expected to spend more than 1% of their turnover. According to the report (World Wide Worx, 2004), the personal computer, along with consumables like ink cartridges, paper and disks, remains the most important item in budgeting for IT purchases among SMEs in South Africa. After personal computers and consumables, software runs a close third, followed by servers and peripherals, such as printers and scanners. Laptops remain a distant priority, in eighth place, ahead of only personal digital assistants (PDAs) and wireless technologies. “The findings confirm international research on the South African market, which shows PCs outselling laptop computers by a ratio of almost 4 to 1,” says George du Plessis, SMB Segment Manager at Hewlett-Packard South Africa. “Laptop sales may be growing faster than any other format, at 73% for the first quarter of this year, but desktop PCs still grew at 51%.” (World Wide Worx, 2004).

According to the latest BMI-Techknowledge (2005) survey on SME IT end-user trends, this sector spends more on hardware and software than it spends on IT services, with companies generally spending on IT in line with their rate of growth. Figure 3.3 contains a comparison of hardware, software and IT services percentage allocations for the SME sector and the corporate sector in 2005. Corporate companies spend a higher percentage of their IT budget on IT services, whilst the SME sector spends a higher percentage on software and hardware.

Figure 3.3: Comparison of average percentage allocations of IT budget to technology: SME sector vs. corporate sector



Source: BMI-Techknowledge (2005)

The low ranking of new mobile technologies is an indication of the fact that SMEs operate in the here-and-now, with budgets oriented almost entirely around practical demands, rather than the nice-to-haves, the unknowns, and the cutting edge technologies.

In the absence of more specific research on the number of accountants employed in the various business forms in South Africa, it is assumed from the discussion in section 3.2 From this investigation it can be concluded that most accountants, when entering the profession (whether working in public practice or for in industry and commerce), most likely will work for (or audit) a private company or close corporation that probably will use some form of basic IT in the organisation. This assumption is supported by an analysis of the information in table 3.2 indicating that 62% of accountants in public practice either work for small or medium practices or operate as sole practitioners that most probably will deal with small and medium enterprises rather than listed companies.

In the next section, the South African IT environment will be analysed.

3.3 The South African software application environment

For accountants to be competent in information technology, they must apply their IT skills in a relevant business or accounting context. Accountants operate in the South African business environment, whether as financial managers working for a specific business organisation, or as independent auditors evaluating the financial information of other business organisations or advising business organisations on their financial systems. Competences (or skills) were earlier defined as the ability to perform (or do) a specific action with reference to *real working environments* (IFAC, 2003b:12-13). It is therefore relevant to investigate the typical working environment regarding technology that professional accountants will encounter when applying their skills.

3.3.1 *General office software environment*

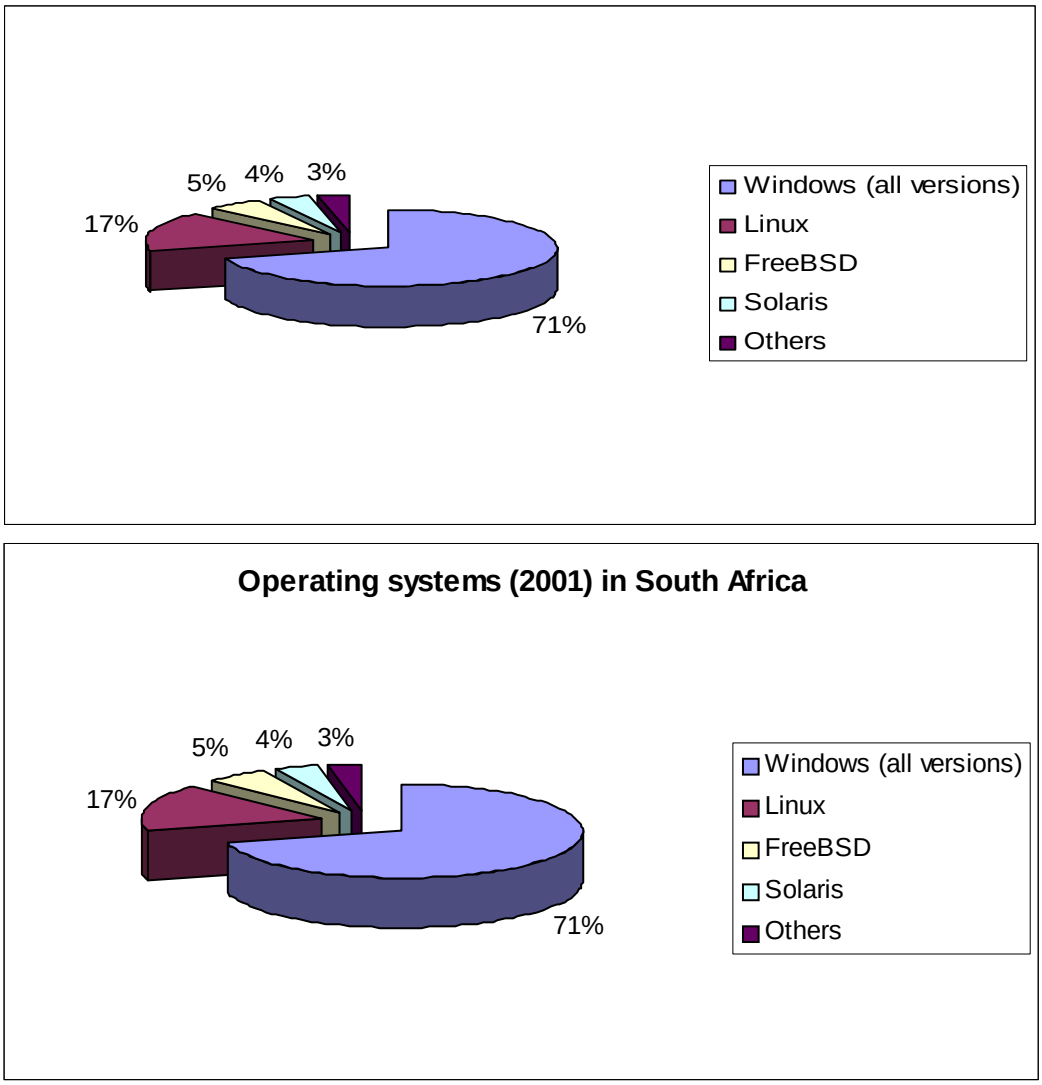
The general office software environment refers to the general applications used by an accountant on a daily basis in a South African business environment. This software includes the operating system (and related utility software), communication software (e-mail and internet) as well as office software helping the accountant to perform his/her job more efficiently and effectively (word processing, spreadsheets, presentation software, and database management software).

3.3.1.1 System software

System software includes the operating systems used on clients' computers as well as operating systems used on enterprises' servers, as well as utility software available to end-users.

According to research conducted by Netcraft (2004), the following distribution of operating system software was reported at server sites in South Africa in 2001 as depicted in figure 3.4.

Figure 3.4: Operating systems used on servers in South African organisations in (2001)



Source: Netcraft (2004)

Windows operating systems (including all their various versions) dominate the South African market with a total of 71% of installations, followed by Linux with 17%. The results of this survey are confirmed by a report published by BMI-Techknowledge (2004a), which concluded that Microsoft operating systems have a market share of 77%, with Linux having a market share of 14% in the server market in 2003.

While Linux's popularity on server systems is relatively high (14%-17%), the operating system does not enjoy the same widespread use on client systems. IDC recently released its numbers for the client market, showing that Windows accounted for 87% of all worldwide sales in 1995 (predicted to decline to 85% in 2004). Of the

13% of the market not buying the Windows operating systems, about 5% purchased an Apple computer running the Mac operating system (Miles, 2004). According to Gartner Research (2004), the different versions of Windows operating systems are installed on 98% of all computers in Africa, with Linux and Mac OS each having a 1% share of the market. Linux software can be obtained for free of charge and be copied and modified, unlike Microsoft's software. A survey conducted by the Yankee Group has found that although there is a growing momentum in Linux software, it will not make a perceptible dent in the worldwide 94% market share of Microsoft between now and 2006 (ITWeb, 2004).

3.3.1.2 Communication software

According to the Goldstuck report (2004), 3,1 million South Africans had access to the internet at the end of 2002. With growth in 2003 set at 6%, 3,28 million South Africans were expected to have access to the internet by the end of 2003. This is a mere 1 in every 13 South Africans. This annual survey included a survey of small, medium and micro enterprise usage of the internet in South Africa, with almost half of the surveyed enterprises reporting e-mail as their primary use of the internet, while a third cited banking as their primary online activity. According to BMI-Techknowledge's survey on business electronic banking (2004b), 85% of companies surveyed used the internet for, and have confidence in, electronic banking.

According to data compiled by WebSideStory Inc, Microsoft's Internet Explorer has held more than 95% of the world-wide browser market since June 2002 (McMillan, 2004).

3.3.1.3 Office software

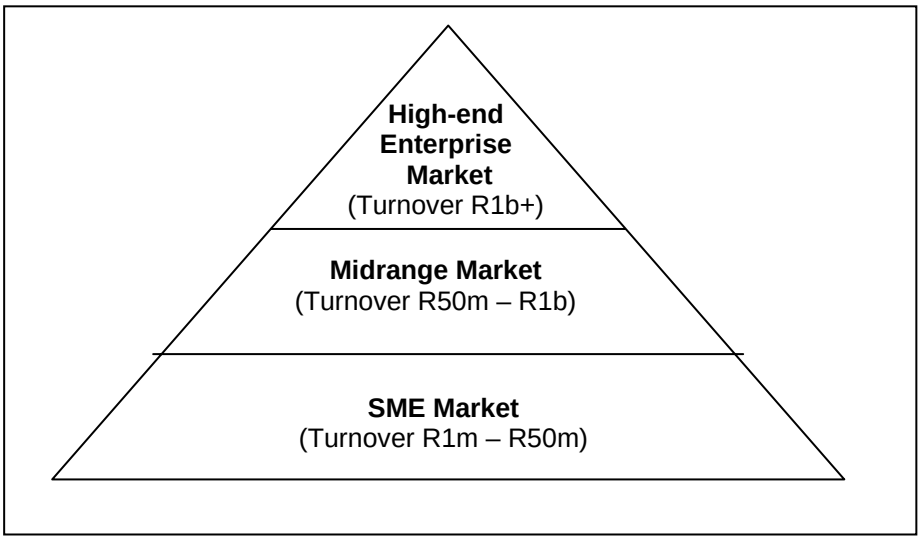
Gartner's 2003 survey of the relational database management systems (RDBMS) showed that IBM's DB2 package had 35% of the market share, with Oracle having a 36,2% market share and Microsoft's Access having a 9% market share (Computerweekly, 2004).

According to BMI-Techkowledge (2004a), Microsoft's Office Suite was used in 95% of all desktops in South Africa, with OpenOffice (a Linux-based application that mimics Microsoft's Office Suite of document, spreadsheet and presentation programs) used by less than 4%. Microsoft's Office Suite consists of Microsoft Word (for word processing), Microsoft Excel (for spreadsheet processing), Microsoft Powerpoint (for presentations) and Microsoft Access (for database management).

3.3.2 *Business accounting software environment*

In From 2001 to 2003, Accountancy SA in partnership with CS Holdings undertook an extensive survey into the availability and use of accounting software packages in South Africa. In their survey they established that there was a large variety of accounting software packages available in South Africa, ranging from packages ideally suited for small or medium businesses to the large and fully integrated ERP (enterprise resource planning) packages specifically suited to the high-end enterprise market. The survey was divided into three phases, establishing for each phase the software packages ideally suited for a particular market segment (figure 3.5). (Accountancy SA, 2001)

Figure 3.5: Market segments

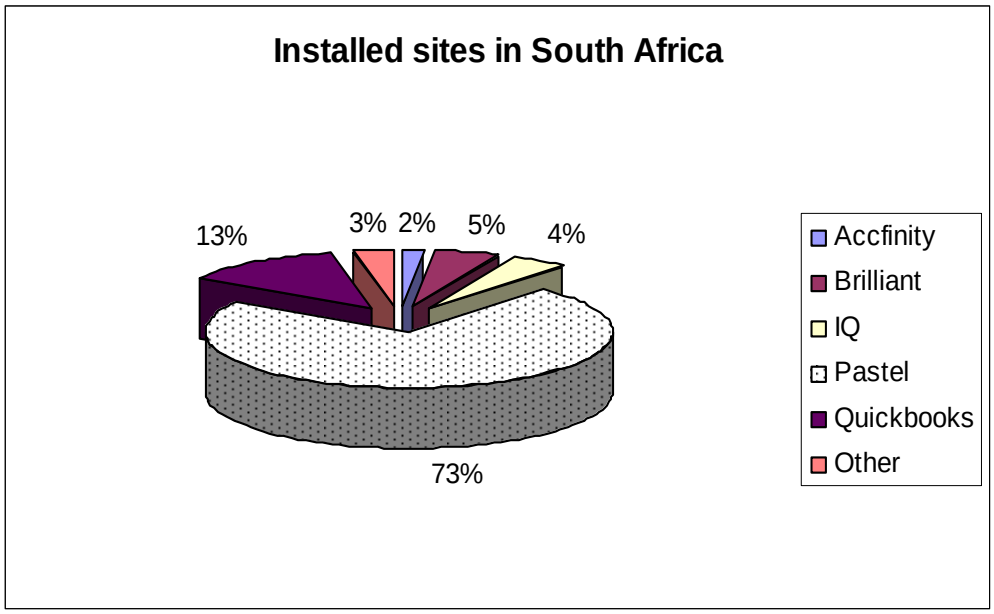


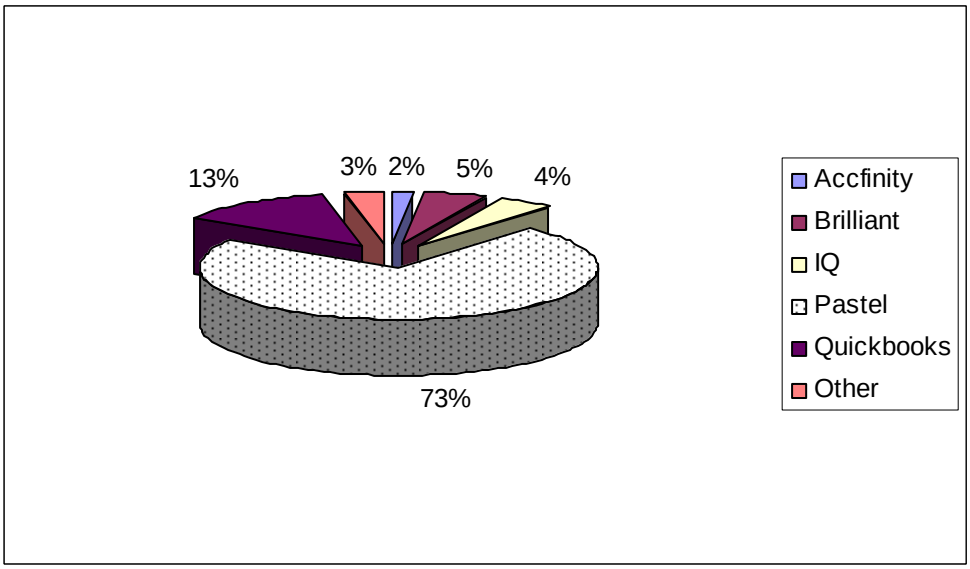
Source: Accountancy SA (2001)

3.3.2.1 <u>Accountancy packages for SME market</u>

An investigation into the different accountancy packages used by the SME (small and medium enterprise) market was conducted in this survey by identifying the total number of installed sites per packages in South Africa. As seen in figure 3.6, Pastel dominates the SME market with more than 70% of the market share.

Figure 3.6: INumber of installed sites for SME market in South Africa





Source: Adapted from Accountancy SA (2001)

The survey concluded that the choice as the ideal product for the South African SME market is Pastel Accounting. Pastel has the majority market share in South Africa and is accepted by most trade sectors in the industry (Accountancy SA, 2001.)

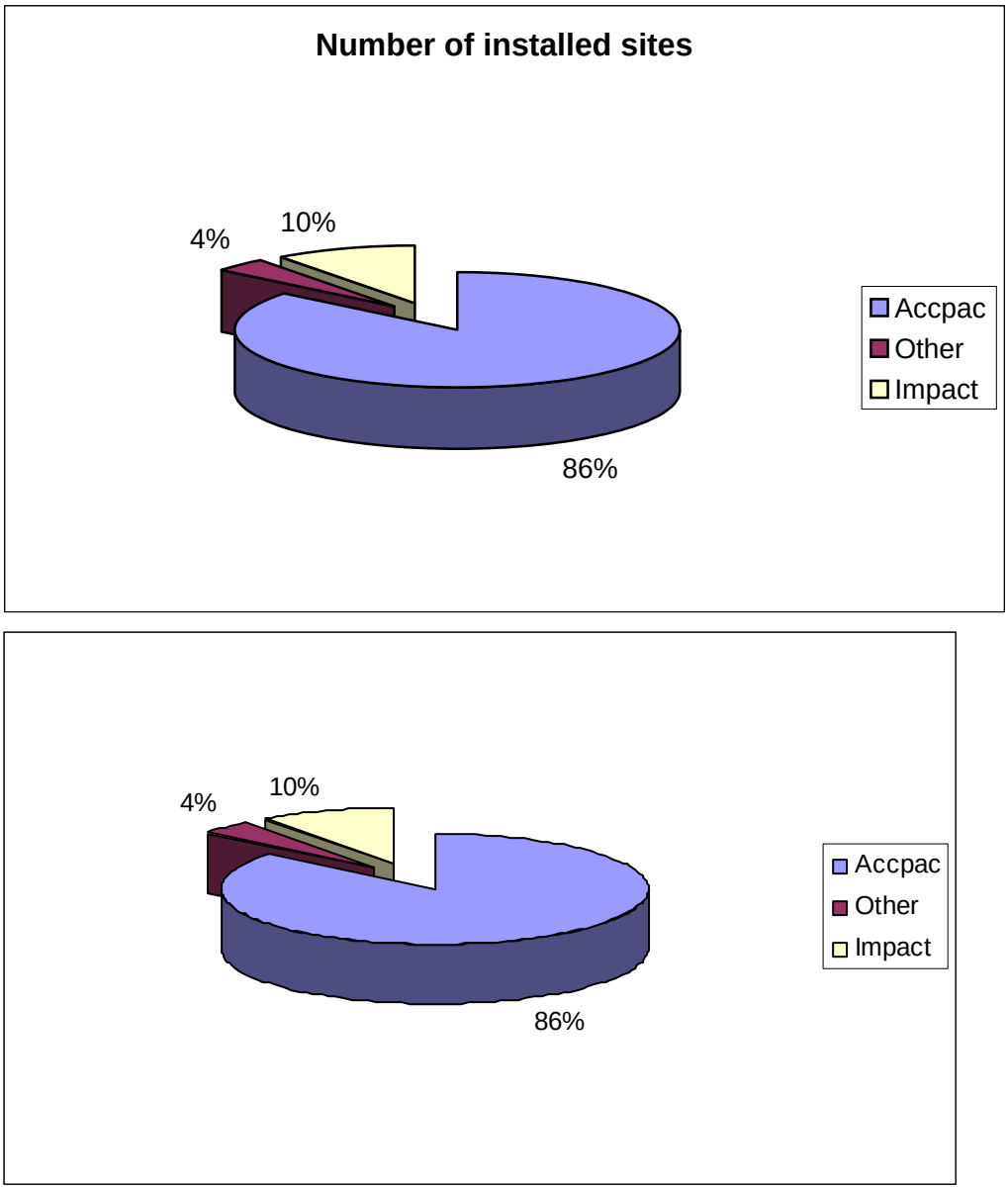
3.3.2.2 Accountancy packages for the midrange market

On the basis of the criteria below the panel selected the following packages for their survey: Ability, Accpac, BMS, Impact, Microsoft Great Plains, Navision Attain, Omnix, Sage & SunSystems:

- the software packages specifically designed for and targeting the midrange market;
- installed base and market share in the South African market; and
- the number of years in business.

Figure 3.7 contains a summary of the total number of sites installed in South Africa. As is evident from this graph, Accpac has the overall market share of 86%, with Impact having a 10% market share. The other packages all have fewer than 200 sites installed in South Africa (Accountancy SA, 2002).

Figure 3.7: Installed sites for the midrange market sector in South Africa



Source: Adapted from Accountancy SA (2002)

Most of these software packages that were evaluated require a fairly high level of expertise in computer literacy and financial accounting skills from consultants and users. The survey concluded that all the financial accounting software products in the midrange market offer excellent flexibility and functionality.

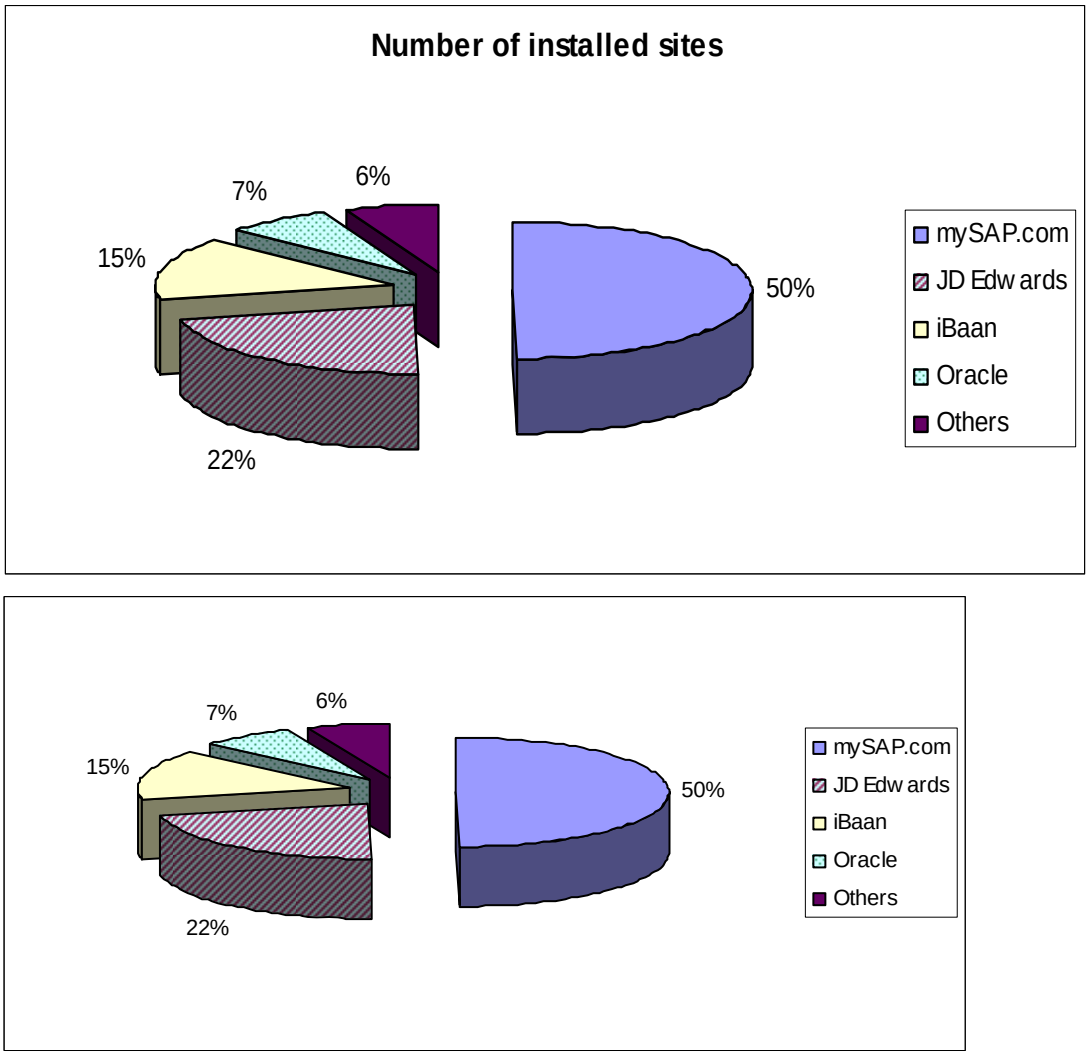
3.3.2.3 Accountancy packages for the high-end enterprise sector

There is a variety of accounting software packages available in South Africa that target the high-end enterprise market. The following packages were included in the

survey that was conducted: Arelon/Elevon Financials, iBaan, JD Edwards, Lawson, Oracle eBusiness Suite, PeopleSoft, mySAP.com (Accountancy SA, 2003).

Figure 3.8 indicates the number of installed sites in South Africa. From this figure it is clear that mySAP.com is the industry leader, with 50% of the market share, followed by JD Edwards, iBaan en and Oracle.

Figure 3.8: Number of iInstalled sites for the high-end market in South Africa



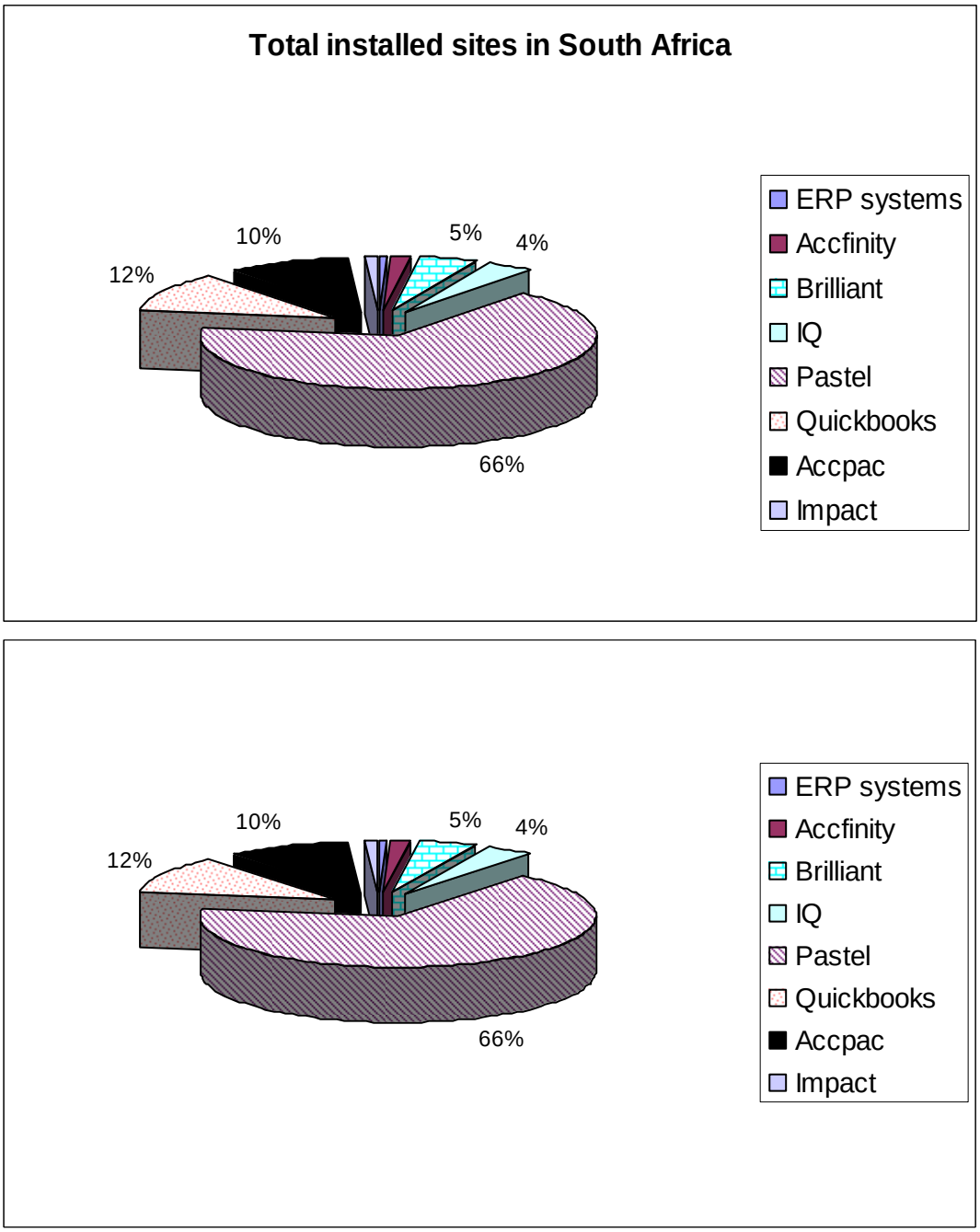
Source: Adapted from Accountancy SA (2003)

A decision by a high-end enterprise to purchase an accounting software package has ramifications that extend beyond the finance function. Large enterprises are increasingly looking beyond pure transaction processing to additional functionality that adds value to the finance function, including budgeting, planning, forecasting, activity-based costing and management. ERP (enterprise resource planning) solutions can also provide industry-specific functionality. The existence of industry solutions enables these packages to meet industry-specific requirements, which accelerates implementation with minimum customisation.

3.3.2.4 Summary of accountancy packages

The most likely accountancy package(s) that will be encountered by future trainee accountants will depend largely on the number of installed sites per accountancy packages. Figure 3.9 compares all the installed software packages in South Africa.

Figure 3.9: Total installed sites of accountancy packages in South Africa



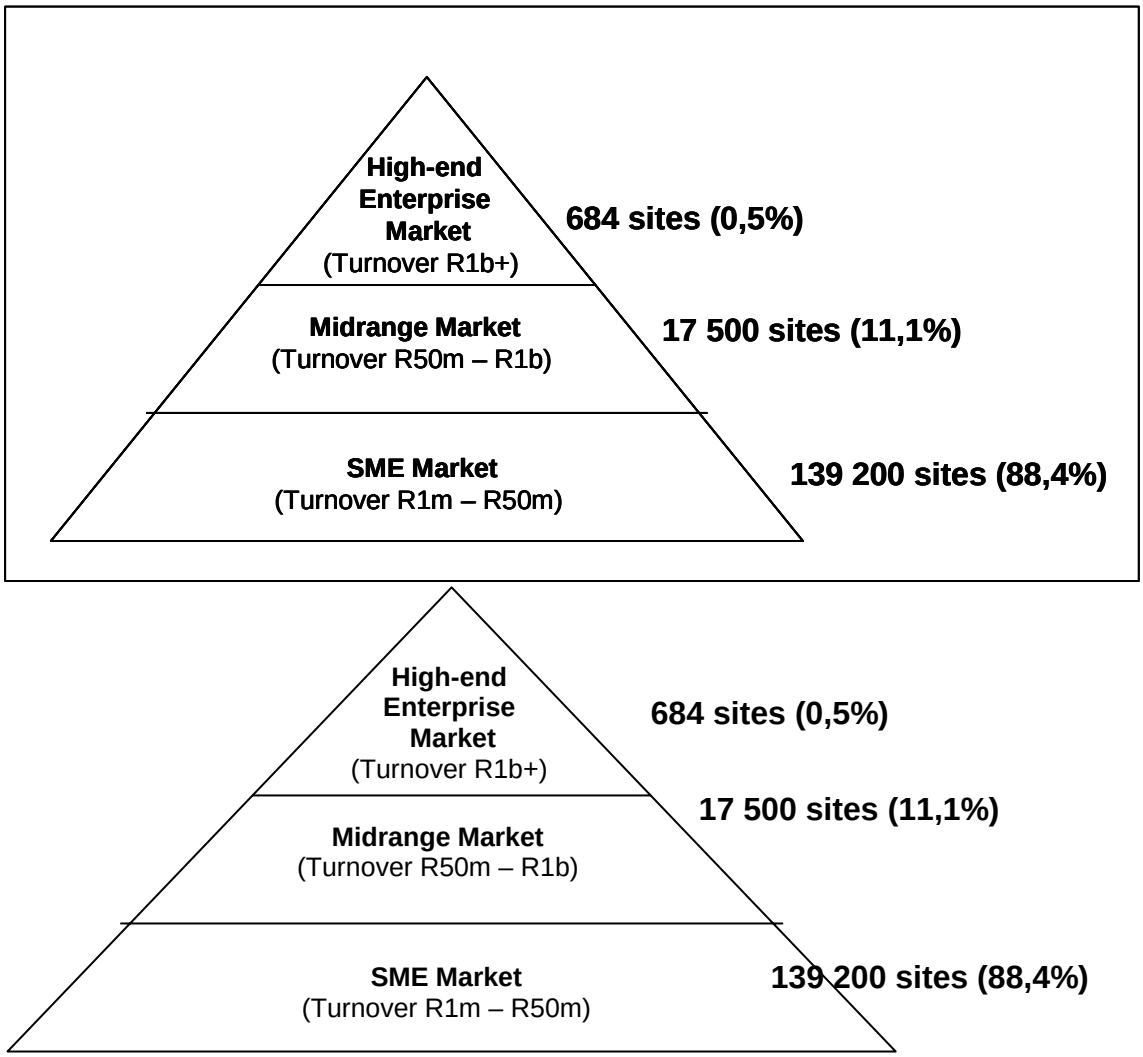
Source: Adapted from Accountancy SA (2001), (2002) & (2003)

From figure 3.9 it is evident that Pastel dominates the accountancy software market in South Africa, with 66% of all installed sites. Quickbooks with 12% and AccPac with 10% follow Pastel. All the ERP systems together account for less than 0,5% of the total accountancy packages installed in South Africa. In order to ensure that future professional accountants have the required competencies in using, auditing and consulting on computerised accounting systems, it would be beneficial to use

Pastel as the accountancy package when training accountantsstudents. The number of installed sites per market sector is also a reflection of the spread of business forms in South Africa.

Figure 3.10 shows combines the total number of installed sites with the business market in South Africa. that the majority of accountants in South Africa will operate in the midrange and SME market.

Figure 3:10: Installed sites per market sector



Source: Adapted from Accountancy SA (2001), (2002) & (2003)

If the majority of accountants are most likely going to operate in the midrange and SME market in South Africa, the prominent business accounting software that is used in this market is Pastel. In providing professional accountants with the skill to be competitive in the South African environment, their training in business accounting software could use Pastel (or Quickbooks) as the tool.

3.4 Conclusion

From the various surveys and research done, it is concluded that the vast majority ofa students (93%) who enters the profession as a trainee accountants will end up

working for a public practice firms (25%) or work for industry and commerce (48%), and be a members of SAICAthe South African Institute of Chartered Accountants. The initial business form most likely to be encountered by trainee accountants is small to medium-sized enterprises (private companies and close corporations) with limited usage of information technology. The small to medium-sized enterprise will most likely use one of the Microsoft Windows operating systems, together with the Office Suite of Microsoft (Word, Excel, Powerpoint and Access). The financial transactions will probably be processed with an accounting package like Pastel or Quickbooks. The internet browser and e-mail software will also be Microsoft products (Explorer and Outlook). Most organisations engage in electronic banking and e-mail.

When the IT curriculum for accountants students in South Africa is designed, the typical business environment (as described in this chapter) should be considered in selecting the software (tool) to be used in the trainingeducation, as well as the practical examples that are used. A skill can only be acquired if students are able to apply that skill in a relevant business context. For accountants to be regarded as competent in information technology, they should be able to apply their skills in a typical South African business environment (context) as described in this chapter.

In the next chapter, an in-depth discussion will be conducted to determine how accountants students can obtain the critical IT skills (as discussed in chapter 2) using the business tools as used in the South African business environment (as discussed in this chapter).

Chapter 4

IT skills framework for the training of South African accountants

4.1 Introduction

A general list of IT skills required by accountantsstudents entering the profession as trainee accountants was identifiedcompiled in chapter 2. The typical South African business environment that the accountant will encounter, together with the typical IT tools/software used by South African businesses, was discussed in chapter 3. Investigative question 43 (section 1.118.3) aims to determine a set of IT skills that is relevant within the South African business environment and that accountants working in the South African business environment should be expected to have. The purpose of this chapter is to refine the general list of IT skills as determined compiled in chapter 2 (table 2.43) to determine which of those skills are critical for the South African business environment and to decide on the knowledge and understanding required within this environment for each of the critical IT skills.

As was discussed in chapter 3, the majority of South African businesses use Microsoft-related products (Windows operating system, Explorer, Outlook, Word, Excel, Powerpoint and Access), together with an accounting package (like Pastel, Quickbooks or Accpac). To be competent in interacting with information technology, the accountant should be able to apply his/her IT skills with the IT tools/software used by South African organisations.

Figure 4.1: IT skills and IT tools

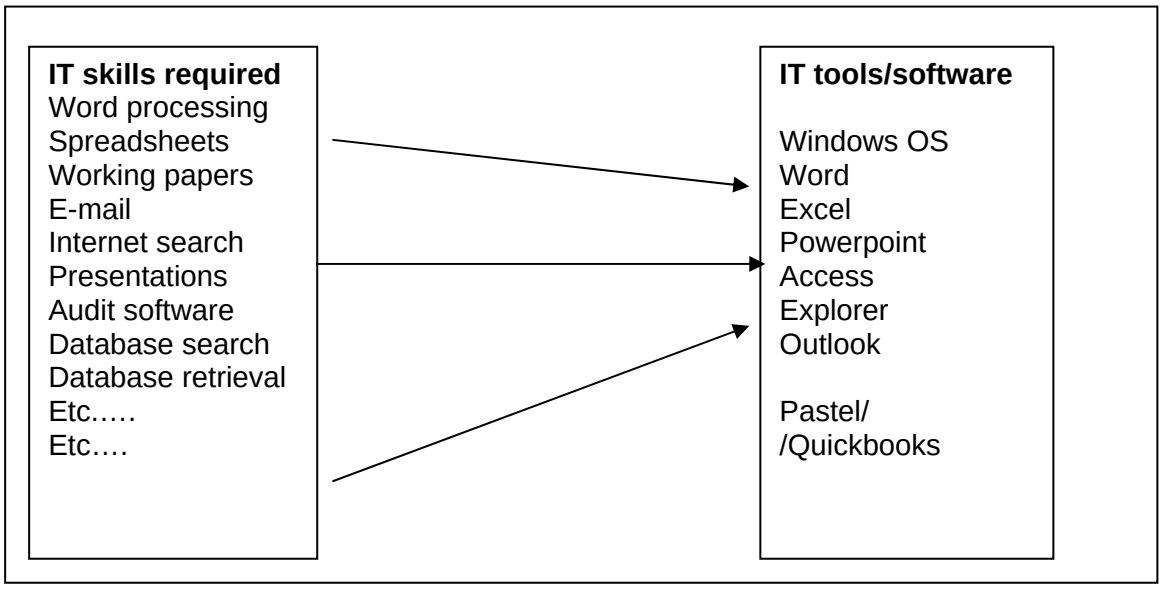


Figure 4.1 illustrates how the IT skills could be acquired (what accountants should be able to do) while utilising the tools/software used in South African organisations. The aim of this chapter is to develop a framework that can be used by educators to ensure that accountantsstudents entering the profession as trainee accountants possess the critical IT skills required to be competent in the South African business environment. The techniques that can be used by educators to ensure that accountantsstudents acquire the critical IT skills by utilising the IT tools/software used by South African organisations will be discussed by identifying the level of competence as well as the detailed actions required for each of the IT skills identified in table 2.43.

4.2 Methodology

According to the Public Accountants' and Auditors' Board (2001:2-8), skills with regard to specific occupational processes and methods can be ranked in descending order as **mastery**, **proficiency** and **ability**. Mastery is the highest level of skill that can be obtained and is defined as "great skilfulness and knowledge of some subject or activity" (Bluerider, 2004). Proficiency is defined as "skilfulness in the command of fundamentals deriving from practice and familiarity" (Bluerider, 2004). Ability is defined as "possession of the qualities (especially mental qualities) required to do something or get something done" (Bluerider, 2004). An additional level of skill was identified as **awareness.** Awareness is defined as "having knowledge of" without necessarily being able to perform the function (Bluerider, 2004), and would be used for those skills deemed not to be critical for accountants students entering the accountancy profession in South Africa. These definitions (as summarised in table 4.1) will be used in identifying the competence level of the IT skills.

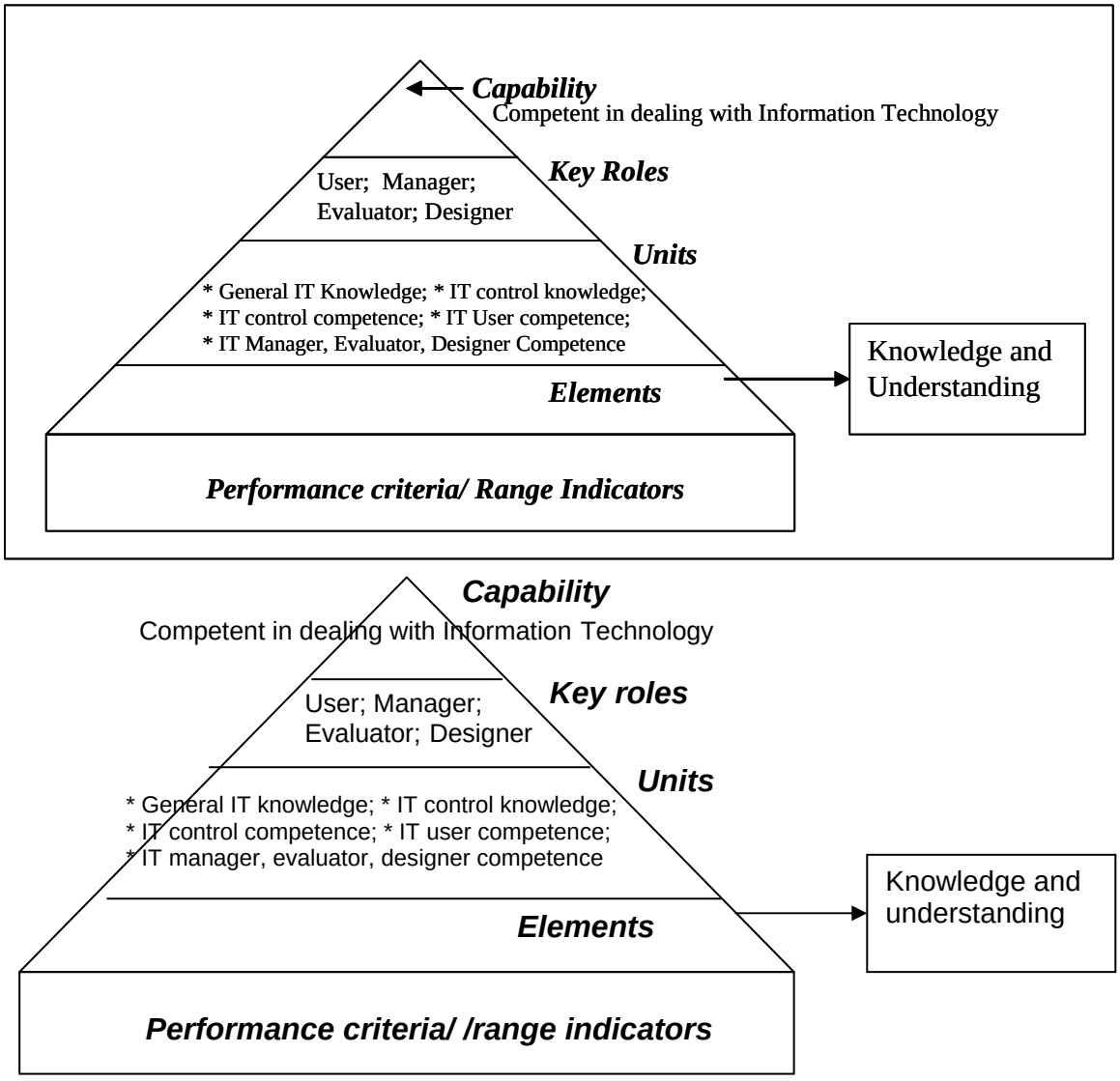
Table 4.1: Levels of skills

Level of skill	**Definition**
Mastery	Complete skills/knowledge to perform activity/function
Proficiency	Fundamental skill/knowledge to perform activity/function
Ability	Basic understanding to perform activity/function
Awareness	Having knowledge of the activity/function without the need to perform it

According to SAICA (2003b:24/03 – 25/03) the required IT skills are expected to be developed by reference to the other four core syllabi, viz. external financial reporting; auditing, assurance services and corporate governance; managerial accounting and financial management; and taxation. In discussing how accountantsstudents can acquire the IT skills required, reference will be made to these other subjects to identify areas and give examples where integration can occur.

As described in chapter 2, the functional analysis method was identified as the methodology used to develop the IT skills framework as depicted in figure 4.2.

Figure 4.2: Functional analysis for information technology



In chapter 3 it was determined that accountants perform diverse functions within the South African business environment, but that there are some commonalities between these various functions. All accountants use information technology in performing their daily functions. Therefore one of the key roles in the South African environment identified accountants as **users** of information technology. This chapter will expand on the previous two chapters to identify the importance of each IT skill for trainee accountants in South Africa by identifying the relevant competence level. This chapter also expands on the various *elements* (see figure 4.2) to give examples of specific *knowledge* and *understanding* required to be regarded as competent in that specific element. This expanded table can then be used in the setting of curricula syllabi for accountants in South Africa as well as a benchmark for evaluating the current training education offered to accountantsstudents in South Africa. During the practical training phase of accountants (as conducted by training firms) these IT skills will be applied by the students in their daily functioning as accountants and they would acquire a higher level of competence than that indicated in this table. However, as the scope of this research is limited to the IT skills level of accountantsstudents after their formal education has been completed and they have been accepted as trainee accountants within training firms, the IT skills table that will be developed will focus on the competence level required at entry as trainee accountants.

In the next section, all the various elements as listed in table 2.3table 2.4 will be discussed to identify the competence required, to give examples of the knowledge and understanding required for that element and to show how each element can be integrated with the other four professional subjects.

4.3 Office automation skills

Accountants are primary users of technology in performing their daily functions. As was discussed in chapter 3 (section 3.2.1.1), accountants perform diverse functions in a wide range of South African organisations. All these functions require accountants to be able to use IT in performing their daily activities. As was seen in section 3.3.1, the general office software environment that accountants most likely will experience requires them to be competent in using office software (like the Microsoft Office Suite). The various office automation skills as identified in table

2.3table 2.4 will be discussed in this section. Office systems include all systems that are designed to increase the productivity of accountants in the office and are focused on accountants as **users** of IT.

4.3.1 *Operating systems and utility software*

According to *Guideline IEG11* (IFAC Education Committee, 2003a), accountants should be able to apply operating systems and utility software in a relevant accounting/business context. As was identified in chapter 3, the relevant accounting/business context for accountants operating in South African organisations is the ability to use the Windows operating system and related utility software (e.g. Explorer). Operating systems are defined as the system software that manages and controls the activities of the computer (Laudon & Laudon, 2004:193). Utility software is defined as system programs performing routine operations (sorting files) and managing data (creating files, copying files) (Laudon & Laudon, 2004:193). The Microsoft Windows family of operating systems and utility software allow the accountant to perform a variety of functions using graphical user interfaces to simplify the interaction with the computer system.

The student should be able to use the basic functions of the operating system and utility software to:

- give instructions to the computer using the graphical user interface (icons, mouse, pull-down menus);
- create and manage file folders on different storage areas (hard disk, network, floppy disk, etc).
- copy, delete and move files from one storage medium to another.

The accountant student needs to be able to use operating systems and utility software so that he/she can interact (give instructions) with a computer system using a Windows-based operating system and can manage his/her files and folders. Therefore the level of skill required is categorised as *ability*. In acquiring this ability, students should be required to interact with a Windows operating system by performing the basic functions themselves (either through practical assignments or hands-on tutorial sessions).

4.3.2 *Word processing software*

According to *Guideline 11IEG 11* (IFAC Education Committee, 2003a), accountants should be able to apply word processing software in a relevant accounting and business context. Word processing software is defined as office system technology that facilitates the creation of documents through computerised text editing, formatting, storing and printing (Laudon & Laudon, 2004:43). As was identified in chapter 3, the majority of South African organisations use Microsoft Word as their word processing software.

According to research conducted by Coy, Buchanan, Nelson and Fisher (1999:8), word processors are the application used most commonly by accountants (90% of accountants in New Zealand, Australia and Canada). Accountants use word processing software to write reports to clients, customers and the management of the organisation. To be able to prepare these reports, students should have a basic *ability* in using word processing software (e.g. Microsoft Word) to (Naqvi, 2004:79-81) to:

- format a report (e.g. paragraph spacing, format the font (size, type, bold, italic, underline), page numbering);
- manage a report (e.g. printing, saving, retrieving, editing);
- integrate a report (inserting tables, graphs and pictures); and
- communicate a report (e-mailing).

This ability can only be acquired if students perform these functions themselves in practical assignments that are related to typical business scenarios. This IT skill could be integrated with other parts of the syllabus. For example, students can be required to write a report on their audit conclusions and reporting (as defined by the auditing and corporate governance in SAICA's syllabus (SAICA, 2005c3b:55/0547/03)) using Microsoft Word as the tool.

4.3.3 *Spreadsheet software*

According to *Guideline 11IEG 11* (IFAC, 2004), professional accountants should be able to apply spreadsheet software in a relevant accounting/business context. Spreadsheet software is defined as software that can display data in a grid of

columns and rows with the capability of easily recalculating numerical data (Laudon & Laudon, 2004:203).

According to the surveys that were discussed in chapter 3, Microsoft Excel is used extensively by South African organisations. Spreadsheets have become one of the main tools used by accountants and financial managers in performing their duties (Kreie & Pendley, 1998). Gallun and Heagy (1996) reported that, by 1995, 100% of medium-sized accounting firms in America used spreadsheets. Coy, *et al. (*1999:2) concluded in their research that the tools of greatest benefit to accountants were word processing, graphics and spreadsheet software, with more than 80% of all accountants in New Zealand, Australia and Canada using spreadsheets on a daily basis.

Because professional accountants use spreadsheets extensively, they need an in-depth knowledge and competence in the use of spreadsheets. The level of skill required at entry level from a trainee accountant is identified as *proficiency*. According to the research conducted by Coy, *et al.* (1999:11-12), spreadsheet software is used most frequently for compiling operating budgets, management reports, modelling, basic recordkeeping, variance analysis, capital budgets, financial accounts, tax calculations and depreciation schedules.

Students should be able to:

- design financial spreadsheet models and be able to:
    - determine the layout (columns and rows);
    - format the layout;
    - use formulas and functions; and
    - insert charts and tables;
- operate a spreadsheet model to:
    - sort, print, save, retrieve a worksheet;
    - extract information (lookup, data filter); and
    - summarise information (data tables, graphs).

Students will only be able to achieve the skill level of *proficiency* if they are exposed to spreadsheet software through completing practical assignments containing

business related problems. Spreadsheets could be integrated with other areas of the SAICA's syllabus by developing practical assignments relating to the core subjects in using spreadsheet software as the tool. This will not only improve their information technology skill in using spreadsheet software, but also their knowledge of that aspect of the syllabus used in the assignment. Examples are:

- Financial statement analysis to assess the financial position and performance (SAICA, 2003b2005c:3126/0305)
- Assigning overheads to cost objects (SAICA, 2003b2005c:7158/0305)
- Decision making (pricing; make or buy; product mix) (SAICA, 2003b2005c:7359/0305)
- Budgeting and standard costing systems (SAICA, 2003b2005c:7259/0305)
- Sensitivity analysis (SAICA, 2005c:73/05)
- Ratio analysis and interpretationsValuations (SAICA, 2003b2005c:7561/0305)
- Capital investment appraisal decisions (SAICA, 2003b2005c:7662/0305)
- Management of working capital, e.g. economic order quantity (SAICA, 2003b2005c:7863/0305)
- Substantive analytical procedures (including CAATS) (SAICA, 2005c:54/05)
- Applying the general deduction formula in calculating tax liability (SAICA, 2003b2005c:8870/054)
- Taxation of companies and individuals (SAICA, 2003b2005c:9071/054)
- Calculating employee's tax and provisional tax (SAICA, 2003b2005c:9274/054)
- Calculation of capital gains tax (SAICA, 2003b2005c:93/0574/04)
- Calculation of value-added tax (SAICA, 2003b2005c:104/0580/04)

If they are proficient in the use of spreadsheet software, accountants students will be able to use this software to acquire other critical IT skills, as is discussed later in this chapter (for example auditing software -, database software -, and accounting software skills).

4.3.4 *Presentation software*

Laudon and Laudon (2004:204) define presentation software as software used to create professional quality graphic presentations that can incorporate charts, sound,

animation, photos and video clips. Accountants use presentation software when doing presentations to communicate financial and other information (Naqvi, 2004:80).

The students should have the *ability* to:

- design a basic presentation
  - insert text, graphics, charts in the presentation
- make the presentation
  - display and print the presentation

When acquiring this ability students should be required to perform these tasks on business-related cases using software like Powerpoint. The findings of their research (see section 4.3.6) can be communicated using Powerpoint. The accountant students can summarise the findings of an investigation into the financial position and performance of an organisation and present it by using Powerpoint (SAICA, 2005c3b:3125/053) or use it in the communication of audit matters to those charged with governance (like an audit committee) (SAICA, 2005c:53/05).

4.3.5 *Internet tools/software*

Electronic mail (e-mail) is used for transmitting messages electronically between computers (Laudon & Laudon, 2004:205). Documents and reports (as designed in other software packages) can be attached to e-mail software to be sent electronically to another computer user. Microsoft Outlook is used by most South African organisations. Accountants need to be able to use e-mail software to communicate and forward documents electronically. Students can acquire this *ability* by performing these tasks on a computer (e.g. by e-mailing a Word document as created in section 4.3.2 to another user).

Web browsers are easy-to-use software tools for displaying web pages and for accessing web and other internet resources (Laudon & Laudon, 2004:205). Microsoft's Internet Explorer can be used as a web browser to train an accountant student to access the internet. The internet can be used for business-related cases

to search for financial and/or other information required by the accountant (see section 4.3.6).

4.3.6 *Professional research tools*

Accountants need to be able to find and extract relevant information when performing their duties. Locating information on the internet is a critical function in obtaining relevant, up-to-date and complete information. Several companies have created directories of web sites that provide search tools for finding information. To search the directory, the accountant must be able to enter key word(s) to find relevant web sites or information. In South Africa there are a number of sites with directory listings (for example IAFRICA and MWEB) that accountants can use to obtain relevant information. The accountant must also be able to use search engines. Search engines contain software that look for web pages containing one or more of the search terms, with the subsequent results displayed and ranked according to location and frequency of the search terms (Laudon & Laudon, 2004:289). Various search engines can be used, for example Ananzi, Google and AltaVista. Accountants must to be able to use search engines to locate and retrieve relevant information when doing research on a specific topic or problem.

In SAICA's syllabus the topics below can be researched and searched for by using the internet. However, any topic or issue relating to the work of a professional accountant can be searched and researched using the internet as a tool. Examples of typical areas of the syllabus that students can be required to research are:

- GAAP, Companies Act, JSE Securities Exchange requirements, King Report (SAICA, 2003b05c:3126/0305)
- New developments in the regulatory environment governing corporate entities in South Africa (SAICA, 2003b05c:4536/0305)
- Company Law, Public Finance Management Act, Close Corporations Act (SAICA, 2003b05c:4536/0305)
- Corporate governance developments (Blue Ribbon Report, Sarbanes- Oxley, Hampel, Smith and Higgs, and King II Report) (SAICA, 2003b05c:4537/0305)
- SAICA constitution and bye-laws; SAICA Code of professional conduct (SAICA, 2003b05c:4638/0305)

- Auditing and assurance guidance issued by SAICA, PAAB, IAASB, IFAC (SAICA, 2003b05c:5040/0305)
- Developments in cost accounting (ERP, JIT, ABC, etc.) (SAICA, 2003b05c:7258/0305-59/03)
- Income Tax Act and related acts and court decisions; interpretation and practice notes issued by SARS (SAICA, 2003b05c:9668/0405)

4.3.7 *Image processing software*

Image processing is the conversion of paper documents into electronic format through scanning. Documents can be scanned as images or documents that can be converted to text so as to be used in word processing software. The scanned image can be stored digitally, retrieved at a later stage and sent electronically to other users (Bagranoff, *et al.*, 2005:504-505). The student should be *aware* of the issues relating to:

- scanning documents as images; and
- converting documents into text files.

Accountants generate lots of paperwork. During the auditing process, working papers that are compiled by the accountant can be scanned and stored electronically for later referral.

4.4 Database management skills

A database is defined as a collection of data organised to service many applications at the same time by storing and managing data so that they appear to be in one location (Laudon & Laudon, 2004:223). A database management system is the software that permits the creation and maintenance of a database, and it enables individual business applications to extract the data (Laudon & Laudon, 2004:224). Relational database management systems are primarily used in business organisations. A relational database management system (RDBMS) is a type of logical database that treats data if they were stored in two-dimensional tables. It can relate data stored in one table to data in another as long as the two tables share a common element (Laudon & Laudon, 2004:225). Database software is vital for businesses. Through exposing students to consider information first, and then to

progress to tools for its analysis and presentation (database software) they would have a greater appreciation of the role of databases in business and will be encouraged to acquire more IT skills (Naqvi, 2004:80).

The skills required by entry-level trainee accountants when dealing with databases and database management systems will be discussed in the following section.

4.4.1 *Design and use of a database*

Business organisations use relational database structures. The skill to design and use databases can be gained by working with spreadsheet software (like Excel) or a database management system (like Access). As spreadsheet software allows two-dimensional tables, the required skills in the designing and use of databases can easily be acquired by using Excel. Databases are created separately from the database management system. Most databases can be accessed by using Excel as the database management system. According to Naqvi (2004:82) sStudents should be *able* to:

- design database tables (database structure with field names and records);
- edit, add and delete records from a table;
- update records with transaction data; and
- change the structure of the database.

As financial transactions are created and stored in databases, the accountant student should be *proficient* in using the database management systems. According to the SAICA syllabus, students can use their database skills to:

- select, measure, understand, record and classify accounting transactions (SAICA, 2005c:3b:3025/053);
- record material costs (SAICA, 2005c3b:7158/053);
- manage inventory (SAICA, 2005c3b:7862/053);
- manage cash (SAICA, 2005c3b:7763/053).

4.4.2 *Searching for and retrieving information from a database*

Accountants are one of the primary users of information contained in databases. Whether they are financial managers needing to extract or retrieve information from

databases or auditors evaluating the quality of the information contained in the databases, searching for and retrieving information from databases are critical skills that accountants need to have. Organisations use a variety of different software to manage their databases (including business application software). However, it is possible to import almost any database into a software package that the accountant is familiar with so that he/she can search for and retrieve information. As was discussed in section 4.3.3, accountants use spreadsheet software (like Excel) extensively. Spreadsheet software therefore can be used to ensure that accountants students acquire the skill to be *proficient* in searching for and retrieving information from a database. Naqvi (2004:83-84) argues that For accountants students should to be competent in searching for and retrieving information from a database, they and should be able to:

- import a database into a spreadsheet package (like Excel);
- sort the information in the database;
- search for information contained in the database using data query tools (like data filter technique/ /find);
- retrieve information contained in a database (using data filter or lookup-functions);
- perform calculations on the data contained in the database (database functions; data tables); and
- summarise information contained in a database according to specific criteria (database functions, data tables, pivot tables, graphs).

The accountant performing the audit function will use the skill acquired in working with databases extensively during the auditing process (see section 4.6). As a management accountant, the accountant can use the skills to:

- calculate, record and report information necessary for effective cost management (SAICA, 2005c3b:7057/053); and
- provide appropriate information for decision making (SAICA, 2005c3b:7057/053).

4.5 Accounting and related office skills

Most financial transactions are recorded with the aid of accounting business software. In this section, the critical skills required and the techniques used to acquire them through interaction with business and accounting software will be discussed.

4.5.1 *Business accounting software skills*

Accounting software includes all software that is used by organisations to record their financial transactions and to extract information and reports for management purposes. Various descriptions or levels of accounting software are used by organisations, for example:

- *transaction processing systems* perform and record the daily routine transactions necessary to conduct the business (Laudon & Laudon, 2004:41);
- *management information systems* support the managers in their functions of planning, controlling, and decision making by providing routine summary and exception reports (Laudon & Laudon, 2004:43);
- *executive information systems* support the strategic level managers in addressing unstructured decision making through advanced graphics and communications (Laudon & Laudon, 2004:45); and
- *enterprise resource planning systems* integrate all the different processes of an organisation (supply chain, customer relationship, human resources, operations, etc) into one enterprise system (Laudon & Laudon, 2004:51; Granlund & Malmi, 2002:300)).

The business accounting software that is used by organisations incorporates different levels of the various systems as described. In South Africa, as was discussed in the previous chapter, the majority of business accounting information systems are used by the small to medium-sized enterprises, with organisations opting to use software like Pastel or Quickbooks (with 78% of installed sites).

For a studentn accountant to acquire the critical skill of understanding the workings of a business accounting package, he/she should be *able* to:

- install or set up an accountancy package;
- set up accounts (customers, suppliers, inventory, tax, general ledger);

- record various types of transactions (customers, suppliers, general ledger);
- extract reports (financial statements);
- do periodic processing (month-end, year-end, inventory count, bank reconciliation);
- export the data to a package (like Excel) for investigation and analysis; and
- implement the desired level of internal (programmed) controls to enhance the quality of information.

If they can perform the abovementioned functions, accountants students should be *able* to use accounting software packages. The following areas of SAICA's syllabus can be integrated:

- selecting, measuring, understanding, recording and classifying accounting data as well as understanding, selecting and recording non-financial information (SAICA, 2003b2005c:3025/0305);

•elements of financial statements (SAICA, 2003b:25/03);

•recording of material costs (SAICA, 2003b:58/03);

- identify the appropriate elements of financial statements and apply them to the presentation of financial statements (SAICA, 2005c:30/05);
- recording of material costs (SAICA, 2005c:71/05);
- inventory valuation (SAICA, 2003b2005c:7158/0305);
- recording of labour costs (SAICA, 2003b2005c:7158/0305);
- recording of overhead costs (SAICA, 2003b2005c:7158/0305);
- budgeting (SAICA, 2003b2005c:7259/0305);
- management of working capital (accounts receivable, inventories, accounts payable) (SAICA, 2003b2005c:7863/0305);
- value-added tax (SAICA, 2003b2005c:10280/0405);
- design of internal control systems including IT environments (SAICA, 2005c:47/05);
- assessment of internal control systems including CIS environments (SAICA, 2005c:47/05).

•information system processing operations and controls (SAICA, 2003b:106/03)

4.5.2 *Tax return preparation software*

Tax return preparation software includes all software that allows the user to prepare a tax return form for individuals and/or organisations in a format that is acceptable to the South African Revenue Service (SARS). According to Engelbrecht (2005:218) sStudents should be *able* to:

- identify, extract and enter sources of income and deductions;
- calculate the tax using tax tables and tax schedule calculation;
- file tax report (including VAT returns) with SARS.

Accountants Students should be *able* to identify the relevant sources of income and deductions (SAICA, 2005c3b:8767/054-8973/054) and enter them into a model that calculates the tax due. This can be done by using tax return models that have been created on a spreadsheet or by using dedicated software (like software available through SARS).

4.5.3 *Time management and billing systems*

Time management and billing systems are software programs that allow the accountant to capture, manage, bill and report time spent on professional duties (Bagranoff, *et al.*, 2005:229-230). By using a spreadsheet, the accountant student can use/create a model where he/she is *able* to perform the following techniques:

- capture the information required to calculate time spent on specific activities;
- extract/compile time billing per client/activity.

When the audit process is planned, these skills can be incorporated when students ith the following elements of the SAICA syllabus:

pplanning considerations and, development and documentation of audit engagements (SAICA, 2005c3b:5345/053).

;

•assigning and scheduling staff with appropriate IT skills to perform the IT assurance engagement or project (SAICA, 2003b:111/03).

4.5.4 *Knowledge management systems*

Knowledge management systems are defined as software that aids knowledge workers in the creation, integration and communication of new knowledge in an organisation (Laudon & Laudon, 2004:319). Groupware is defined as software that provides functions for the use of collaborative work groups. Groupware allows accountants to share information with colleagues, and includes features like:

- sending and receiving of messages to individuals or groups (for example Outlook);
- group scheduling of meetings (for example Outlook);
- sharing documents (where a document can be distributed and different users can enter their input, for example Microsoft Office); and
- workflow management (software and hardware that facilitate the capturing and distribution of data).

For accountants, workflow management can be used effectively in:

- image-based workflow systems that automate the flow of paper through an organisation by transferring documents to digital images;
- form-based workflow systems that route forms intelligently throughout an organisation (consist of editable fields); and
- co-ordination-based workflow systems that help the completion of work by providing a framework for co-ordination of action.

Expert systems are computer software that captures human expertise in a limited domain of knowledge. Typical examples of expert systems that can be used by accountants include legal advice systems, tax advice systems and forecasting of economic and financial developments (Brown, Baldwin-Morgan & Sangster, 1995:284).

Intelligent agents are software programs that work in the background without direct human intervention to carry out specific, repetitive and predictable tasks for an individual user, business process, or software application (Laudon & Laudon, 2004:337). They are mainly used as a tool to support the use of the internet and e-mail and will be discussed in more depth in section 4.8.7.

Simulation or virtual reality systems are interactive graphics software and hardware that create computer-generated simulations that provide sensations emulating real-world activities (Laudon & Laudon, 2004:321).

As far as the SAICA syllabus is concerned, students should have an awareness of knowledge management systems. could be required to perform a financial analysis of a company's financial statements. This analysis (done on a spreadsheet and/or word processor) can then be circulated by e-mail (for example Outlook) to other students, who can enter their comments or additional calculations to the original document. A final draft of all the commentary and changes can then be compiled as a group effort (SAICA, 2003b:36/03; 61/03).

4.6 Audit automation skills

For the accountants performing the assurance function, information systems can support them to perform this function more efficiently and effectively. Auditors must be able to employ computer-assisted audit techniques (CAATs), which can aid them in evaluating on-line real-time systems (SAICA, 2005c3b:5445/053). Audit software is typically used for reviewing file data through data file interrogation and through embedded audit modules.

4.6.1 *Electronic working papers*

Electronic working papers are software that generates trial balances and lead schedules for recording evidence in an audit. By using electronic working papers, an auditor can produce an adjusted trial balance, make adjusting journal entries, and automatically generate an adjusted trial balance. The advantage of using electronic working papers is that it automates footing, cross footing, and reconciliation to schedules. Auditors can use this software to prepare consolidated trial balances and financial statements as well as financial statement ratios and measurements (e.g. current ratio, working capital, price-earnings ratio) (Moscove, Simkin & Bagranoff, 2003:370).

Students can acquire a basic *ability* in the use of electronic working papers by developing a spreadsheet model using Microsoft Excel, where students can import the general ledger of an organisation and then compile a trial balance, financial statements and ratio analysis, and also enter adjusting entries into the model to automatically adjust all these statements. Integration with other parts of SAICA's syllabus is possible, for example:

- auditor's responsibility – documentation (at firm and engagement level) (SAICA, 2005c3b:5043/053);
- issues relating to audit reports and financial information presented in an electronic format (SAICA, 2005c:55/05);
- document procedures and their findings during the evaluation of a system (SAICA, 2005c3b:59/05111/03); and
- analyse and evaluate evidence/results of procedures (SAICA, 2005c3b:59/05111/03).

4.6.2 *Generalised audit software*

Generalised audit software is software packages developed to assist in performing common audit tasks (Boockholdt, 1996:579). Although a variety of different types of audit software exists and some auditing firms use their own internally developed software, these programs are capable of the basic data manipulation tasks that spreadsheets or database management systems software may also perform (Moscove, *et al.*, 2003:368). The principles of using these types of software can be taught to students by using spreadsheets (for example Microsoft Excel) as the tool. As accountants students are already proficient in using spreadsheets, they can build on their existing knowledge, which will en*able* them to:

- access data in clients' computer files and export them to the spreadsheet;
- manipulate the data (using the various functions in the spreadsheet):
    - count the number of records in the files (count function);
    - verify the contents of the data file for completeness, arithmetic accuracy and consistency:
        - find duplicate entries (data sort on the document number);

        - find gaps in document numbers (with lookup function comparing document numbers with a pre-compiled list of all possible document numbers);
    - extract records of significance to auditor (data filter/ /data query);
    - summarise contents of data files (data tables/ /database functions);
    - select sample transactions from the data files (using data filter as well as statistical functions);
- perform calculations:
    - perform arithmetic operations (analytical analysis using database formulas);
    - compare contents of two files;
    - sort and merge files (data sort function);
- compile and print reports:
    - ageing schedules (using data table function);
    - audit sample listings;
    - confirmations (Boockholdt, 1996:581).

The contents of the SAICA syllabus that address audit testing procedures to gather audit evidence as covered in the auditing and assurance services section of the syllabus can be integrated, with students acquiring the skills to use IT in performing an audit (SAICA, 2005c3b:5446/053). The student should have the skill to be *proficient* in using software to aid him/her in performing the audit testing function.

By using different software from that used to create the transaction (for example Pastel), the auditor improves his/her independence because it allows the auditor to examine the contents of a client's data files without using the client's software.

4.6.3 *Test data*

The auditor uses test data to evaluate a client's computer application by investigating the logic of the application. Auditors need to develop a file of simulated input transactions for the application to be tested. They should also prepare working papers showing how each transaction should be processed if the program functions properly. The file of test data should contain both valid and invalid transactions and should aim to test as completely as possible the range of exception situations that

might occur under normal processing conditions (Moscove, *et al.*, 2003:360-361). By using a spreadsheet, auditors can generate test data to be entered into the client's application for testing. This technique is used mainly for evaluating the input controls that exist (or are missing) from the application system (e.g. completeness, reasonableness, validity, range, etc. of input data). The results can then be exported from the application and analysed on the spreadsheet.

The accountant can also make use of an integrated test facility to evaluate complex application systems where the auditor:

- creates a dummy cost centre (e.g. number of fictitious credit customers) for use by the auditor in the client's application program;
- creates test transactions for the controls he/she wishes to test (on a spreadsheet);
- creates working papers showing the expected results of processing with these transactions;
- enters the test transactions in the application program and produces print-outs of the results; and
- evaluates the results of the processed transactions with the working papers (on a spreadsheet) (Bagranoff, *et al.,* 2005:437).

Students can acquire the *ability* to work with test data by using a spreadsheet together with an accounting package (like Pastel, which acts as the customer's application) and performing the actions described in this section themselves. This can be integrated with the SAICA syllabus:

- nNature, timing and extent of: tests of controls; substantive analytical procedures; substantive tests of detail (SAICA, 2005c3b:5446/053).

4.6.4 *Simulation*

The objective of parallel simulation is to generate an independent program to simulate part of an application using live input data rather than test data. By comparing the results of the simulation program to those of the actual application, the auditor can evaluate the logic of the application. An alternative to writing a new application is for the auditor to obtain a copy of the organisation's processing

programs, follow its implementation and then maintain control over those programs. Running live data through these programs periodically and then comparing results with those from the company program version currently in use would provide protection against unauthorised changes. To employ parallel simulation, an auditor must have a complete understanding of the company's computer system and must have enough technical knowledge to write a computer program (Moscove, *et al.*, 2003:362-363).

Students can acquire an *awareness* of how to work with parallel simulation by setting up their own program (either in Excel or Pastel) for a specific critical function (e.g. accounts payable) and then entering transactions into another version of a program (for example Pastel) that was set up by the lecturer, and comparing the results (SAICA, 2005c3b:59111/035).

4.6.5 *Flowcharting/data modelling software*

Flowcharting and/or data modelling software is software that uses the source code version of an application to produce flowcharts of the program logic. The auditor can then investigate and evaluate the flowchart as he/she understands the logic of the application and can evaluate the controls used in the software (Bagranoff, *et al.*, 2005:51-52). However, most accounting software used by South African organisations is commercial products where the source code version is not available to the auditor. This audit technique will be used mainly to evaluate accounting software developed internally by an organisation (for example an organisation using an internally developed spreadsheet model). Students can acquire the *ability* to work with and understand flowcharting by compiling their own program flowchart from a model developed on a spreadsheet. By using the "Autoshapes" option on the drawing toolbar of Microsoft (using Powerpoint), a student can reproduce most of the flowcharting and graphics symbols to compile a flowchart. In Auditing students should be able to use flowcharting techniques to assess internal control systems (SAICA, 2005c:47/05).

4.6.6 *Embedded audit module*

Embedded audit modules are programmed routines that are incorporated into a client's application program that is designed to perform an audit function. As the application program executes transactions, the audit module performs functions of interest to the auditor. Embedded modules may alert the auditor by triggering an alarm if transactions exceed expected threshold boundaries and may gather and store copies of the related transactions. The auditor can then evaluate the data and determine whether the fluctuations are normal or require additional appraisal (Le Grand, 2001:5-6). By means of real-time notification the audit module can identify transactions of special interest and display them at an auditor's terminal. By means of tagging the audit module can mark a specified field for certain transaction records that require special attention from the auditor. Embedded audit modules can be complex and difficult to develop and should typically be created during the development of an application system.

Students can use an accounting application developed on a spreadsheet to include a field (using an IF-statement) that will tag all the transactions that meet pre-determined criteria as set by the accountant. All these transactions can then be extracted to a separate worksheet (using a data filter) to be scrutinised by the auditor. Because of the specialisation required to perform embedded audit techniques, students should only be *aware* of how this technique works.

4.7 Management and design skills

Accountants not only function as auditors but also act as financial managers working for a specific organisation, as was discussed in chapter 3. Not only are they responsible for managing the financial affairs of the organisations, but accountants are also included in or responsible for the design and implementation of new accounting systems for organisations. In this section the specific skills required to implement new accounting information systems as well as manage them, will be discussed. However, as was discussed in chapter 3, most organisations in South Africa focus on the basic IT software (as was discussed under the user requirements, section 4.3) to automate the office environment and currently do not spend money or time on new and emerging technology. The level of skills required for accountants in

South Africa would therefore be mostly on an awareness level for the IT skills discussed in the following sections.

4.7.1 *Computer-aided systems engineering software (CASE)*

Computer-aided systems engineering tools are software that allows the automation of the systems development process. CASE tools facilitate the creation of documentation and aids in the co-ordination of team development efforts. They also provide automated graphic facilities for producing charts and diagrams, screen and report generators, data dictionaries, extensive reporting facilities, analysis and checking tools, code generators, and documentation generators (Laudon & Laudon, 2004:471). Accountants who design and implement new software (whether it is a new accounting package or spreadsheet model) should be able to use CASE tools to aid them in following a disciplined approach in designing a new system or model.

Accountants in South Africa are rarely responsible for writing accounting software. They are more likely to install and set up a commercial accounting package (like Pastel) or develop spreadsheet models for various decision making and audit functions they need to perform. CASE software is used mainly by accountants for generating the required documentation explaining the logic of the spreadsheet model or software installation. Students can should acquire an awareness ofthe *ability* to work with CASE software. by using Microsoft Office (Word, Excel, Powerpoint) where they are required to develop the required documentation for a spreadsheet model that they had developed (or produce documentation about the set up and installation of an accounting package).

4.7.2 *Client/server environment*

Client/server computing splits the processing between ‘clients’ and ‘servers’. Both are connected to the network (local area network), but each machine is assigned functions it is best suited to perform. The client is the user point-of-entry for the required function (typically a desktop computer/laptop/workstation) (Bagranoff, *et al*., 2005:509). The accountant interacts directly with the client portion of the application. The server provides the client with specialised services (shared data, printing, network storage). The accountant students should:

- be aware of the security issues when logging his ‘client’ onto the network;

- be able to use the services available through the ‘servers’ (storage/ /printing/ /access to shared data); and
- be able to share files over the network.

Students who use the computer facilities of universities to perform the tasks mentioned in the previous sections will have to acquire the ability to be *able* to work in an environment using networked computers. Some software, documents and files will be installed or saved on the server. Students need to be able to access these services. Individual students gain access to the local university computer network using login names and passwords. They need to be aware about the security issues involved in dealing with a networked environment.

4.7.3 *Electronic data interchange skills (EDI)*

Electronic data interchange (EDI) is one of the key technologies for electronic commerce because it allows the computer-to-computer exchange between two organisations of standard transaction documents such as invoices, payments or purchases (Laudon & Laudon, 2004:267-268). EDI differs from e-mail in that it transmits an actual structured transaction (with distinct fields such as the transaction date, transaction amount, sender’s name, and recipient’s name) as opposed to an unstructured text message.

Although many organisations prefer private networks for EDI transactions (for security reasons), organisations are increasingly using the internet as the communication medium (web-based EDI using XML (extensible markup language) language and XBRL (extensible business reporting language)). XML is a general purpose language that describes the structure of a document and supports links to multiple documents, allowing data to be manipulated by the computer and web-based applications (Laudon & Laudon, 2004:201). The key to XML is the setting of standards that enable both sending and receiving parties to describe data the same way, allowing the entire supply chain of an industry to be easily linked together without requiring business partners to use a particular programming language, application, or operating system to exchange data (Laudon & Laudon, 2004:202).

XBRL is a subset of XML to allow the exchange of financial information between trading partners (Bagranoff, *et al.*, 2005:468).

Accountants Students should:

- understand the difference between EDI using private networks and EDI using the internet with XML and XBRL;
- understand the security and management issues of using EDI.

An example of EDI using a web-based system is the filing of tax return forms with the South African Revenue Services (see section 4.5.2). Another example that can be used to illustrate EDI is performing financial transactions with a bank (EFT – electronic funds transfer) using the internet as the medium. As was discussed in chapter 3, most of the organisations in South Africa use the internet for banking. Students can acquire this basic skill through class demonstrations of an EDI or EFT transaction by lecturers.

4.7.4 *Digital communication*

Digital communication transmits information that is coded into two discrete states: 1 bits and 0 bits. All computers communicate with digital signals, as do some telephone companies and networks. However, if a traditional analogue telephone network is used, the digital signals must be translated by a device (modem) before it can be communicated (Laudon & Laudon, 2004:252).

Communication channels are the means by which data are transmitted from one device in a network to another. Wireless transmission sends signals through air or space without being tied to a physical line and has become a popular alternative to tethered transmission channels (such as twisted wire, coaxial cable and fibre optics). Common technologies for wireless data transmission include microwave transmission, communication satellites, pagers, cellular phones, personal communication services, smart phones, personal digital assistants, and mobile data networks (Laudon & Laudon, 2004:253).

Accountants Students should be able to:

- understand the impact of using different types of channels on the speed (which depends on the bandwidth of the channel and the baud rate) and accuracy of digital communications;
- understand the management and security issues involved in using wireless communications.

This skill can be demonstrated to students where the technology exists. In acquiring the skills mentioned in this chapter, students will also acquire the ability to communicate with other users electronically.

4.7.5 *Network configurations*

Networks can be classified by geographic scope into local area networks and wide area networks. Internal networks (or local area networks) are telecommunication networks that require their own dedicated channels (physical or wireless) and that encompass a limited distance. Wide area networks (WANs) span broad geographical distances that can cover entire continents. WANs may consist of a combination of switched and dedicated lines, microwave and satellite communications (Laudon & Laudon, 2004:258-260).

Students should be able to:

- understand the difference in the use, security and management of local area networks, wide area networks and the internet.

Students who acquire the IT skills as discussed in this chapter in an environment using networked services will also acquire the skill to work and understand networks at the same time. Lecturers can also demonstrate to students the workings of networks.

4.7.6 *Application service providers*

An application service provider (ASP) is a business that delivers and manages applications and computer services from remote computer centres to multiple users via the internet or a private network. Instead of buying and installing software programs, subscribing companies can rent the same functions from these service

providers. Users pay for the use of this software on a subscription or per transaction basis (Laudon & Laudon, 2004:210-211). Many accounting software vendors offer this option, with the client accessing the software and the data across the internet (Moscove, *et al.*, 2003:169).

Students should understand:

- the management and security issues involved in using application service providers rather than acquiring the software/services themselves.

Lecturers can demonstrate to students the advantages and disadvantages of using the services of an application service provider by using examples. For example, Desktop-on-tap, the premiere PipedDreams (2004) product, provides a complete Windows environment and desktop experience to clients. This solution provides the user with a secure Windows session, free from the worry of data loss caused by power outage, line breaks or workstation freezes. This session is enabled with Microsoft Office as well as all licenses required to legally utilise the software.

4.7.7 *Internet service providers*

An internet service provider (ISP) is a commercial organisation with a permanent connection to the internet that sells temporary connections to subscribers (Laudon & Laudon, 2004:282). Most universities in South Africa have a direct link to the internet. The university therefore acts as the internet service provider for the student.

Students should:

- understand the management and security issues when dealing with an internet service provider. This includes the choice of ISP (like MWeb, Telkom, MSN, etc.), the management of e-mail, the hosting and management of web pages, dial-up speed, and security issues.

In working with a networked technology infrastructure at a university, students get the chance to access the internet, have a unique e-mail address and, with the help of lecturers, will understand the issues surrounding internet service providers.

4.8 New technology and security skills

Most large public and private organisations use the internet for electronic commerce and electronic business. When the internet becomes part of the corporate network, the organisation's information systems can be vulnerable to actions from outsiders. To benefit from electronic commerce, supply chain management and other digital business processes, companies need to be open to outsiders such as customers, suppliers and trading partners. Corporate systems must also be extended outside the organisation so that they can be accessed by employees working with wireless and other mobile computing devices. Yet these systems must also be closed to hackers and outside intruders. The new information technology infrastructure requires a new security culture and infrastructure that allows businesses to straddle this fine line (Laudon & Laudon, 2004:461). In this section the accountants' role and interaction with this new infrastructure and the skills required to ensure the security of the systems and information will be discussed.

4.8.1 *Anti-virus software*

Antivirus software is computer programs that scan computer inputs for virus-like coding, identify active viruses that are already lodged in computer systems, cleanse computer systems already infected, or perform some combination of these activities (Moscove, *et al.*, 2003:332). Some operating systems (like versions of Microsoft Windows) include anti-virus software as part of the operating system.

Students should:

understand the importance of installing anti-virus software on systems and the need for regular updating of this software to keep abreast of the latest viruses.

4.8.2 *Encryption software*

For information that is transmitted over the internet that requires privacy or that is sensitive, organisations use data encryption techniques to transform plain text messages into unintelligible cipher text ones. The transformed messages are then

decoded at the receiving station back into plain text (Moscove, *et al.*, 2003:47-48). The use of encryption requires that software be installed on both the sending and receiving computers that will be communicating.

Students should be able to understand the use of encryption software, for example:

- the use of secure sockets layer (SSL) technology that is used during the transmission of encrypted information on the internet (on the user's browser a lock or key icon will be displayed as closed whenever a secure connection is used); and
- the use of public keys (where two sets of keys are used to encrypt information during transmission: public (or digital certificate) and private key).

This awareness can be obtained when students visit (or are shown) web sites that use SSL technology and/or digital keys and observe the behaviour of the software.

4.8.3 *Firewalls*

To gain access to an organisation's files, a user must first obtain access to the network of that organisation. Organisations should protect themselves from unauthorised users accessing their network and files. Firewalls and proxy servers are designed to protect an organisation against unwarranted intrusions from unauthorised users. A firewall is security software that an organisation can install on computers linked to the internet that limits file access to authorised users (Moscove, *et al.*, 2003:45). Firewall software examines packets of incoming messages and ensures that they are from authorised users. A proxy server is a computer and related software that creates a transparent gateway to and from the internet and that can be used to control web access (Moscove, *et al.*, 2003:46).

Students should understand the importance of the use and management of proper firewall technology in protecting the private network of an organisation.

4.8.4 *User authentication*

Authentication involves verifying that users are who they say they are. The three levels of authentication involve what the user has (access to a computer, magnetic card, etc.), what the user knows (unique information such as a login name and

password) and who the user is (unique physical characteristics like a fingerprint or the retina of the eye). Security systems require users to make use of a combination of authentication techniques to ensure that only authorised users gain access to the network of the organisation (Moscove, *et al.*, 2003:45).

Students can acquire the ability to use and understand authentication procedures by using the computer facilities of the university they attend. Most universities use physical user authentication (for example a student magnetic card) and logical user authentication (login name and password) for students to gain access to the university's network. Students should be aware of the security and management issues surrounding authentication.

4.8.5 *Intrusion detection and monitoring*

In addition to firewalls, commercial security vendors provide intrusion detection tools and services to protect against suspicious network traffic. Intrusion detection systems feature full-time monitoring tools placed at the most vulnerable points of corporate networks to continually detect and deter intruders. Scanning software looks for known problems such as bad passwords, checks to see if important files have been removed or modified, and sends warnings of vandalism or system administration errors. Monitoring software examines events as they are happening to look for security attacks in progress (Laudon & Laudon, 2004:462).

Students should understand the use and management of intrusion detection and monitoring software to protect an organisation's network from attempts to disrupt the proper functioning of the network.

4.8.6 *Back-up and recovery*

Organisations use back-up procedures to create duplicate files of their data and/or programs. Such files may be stored off-premises in remote locations. Real-time processing systems use duplicate files that are updated by network links. Files are also protected by file retention measures that involve storing copies of master files and transaction files from previous periods. If current files are destroyed, the files from the previous periods are used to reconstruct new current files. Usually several generations (known as child, parent, grandparent files) are kept for control purposes (O'Brien, 1999:660).

Students should be able to make back-ups of their important files (for example when working with an accounting application software, they should make back-ups of all the data files) and also to recover the data from a back-up file. The Microsoft Windows operating system contains a facility where a back-up can be made of the whole system. If anything happens to the computer, the system can be restored from these back-up files.

4.8.7 *Agent technologies*

Intelligent agents are software programs that work in the background without direct human intervention to carry out specific, repetitive, and predictable tasks for an individual user, business process, or software application. The agent uses a built-in or learnt knowledge base to accomplish tasks or make decisions on the user's behalf (like deleting junk e-mail, scheduling appointments) (Laudon & Laudon, 2004:337-338).

Students can understand the workings of intelligent agents when working with the Microsoft Office Suite. A variety of wizards can be used to 'automate' certain tasks for a user (for example drawing of a chart in Excel). Students can also set up their e-mail software (for example Outlook) so that the intelligent agents can perform actions (for example delete, move, hide) on certain incoming e-mails.

4.8.8 *Data warehousing and data mining*

A data warehouse is a database that stores current and historical data (that originate from diverse applications) of potential interest to managers throughout the company. The data are standardised into a common data model and consolidated so that they can be used across the enterprise for management analysis and decision making. Although the data are available for anyone to access as needed, they cannot be altered (Laudon & Laudon, 2003:236).

Data mining means using a set of data analysis and statistical tools such as regression analysis to detect relationships, patterns, or trends in stored data (Moscove, *et al.*, 2003:234).

Students can acquire the ability to understand the use of data warehousing and data mining by copying data from various systems onto an Excel spreadsheet and then using the various functions and techniques available in Excel to analyse the data.

4.9 Comprehensive IT skills framework

A summary of the IT skills, together with the techniques and tools required to educate accountants in these skills as discussed in this chapter, appears in table 4.2. The competence level required for each skill is also indicated. In designing curricula for the education of accountancy accounting students, more time and practical tutorials should be dedicated to those levels that are indicated as proficiency, mastery or ability. Competence levels indicated as awareness do not require students to be able to do the tasks themselves and would only require students to be made aware of the issues surrounding that specific IT skill.

Table 4.2: IT skills framework

IT SKILLS FRAMEWORK				
Accountant as a user of IT: Business automation skills				
Element	***Capability***	***Level***	***Knowledge and understanding***	***Tools***
Operating systems (section 4.3.1)	Apply operating systems and utility software in a business/accounting context	Ability	Giving instructions using icons, mouse, pull-down menu Creating and managing folders Copying, deleting and moving folders	Windows Explorer
Word processing (section 4.3.2)	Apply word processing software in a relevant accounting/business context	Ability	Formatting a report Managing a report Integrating tables/graphs into report Communicating report (e-mail)	MS Word Outlook
Spreadsheets (section 4.3.3)	Apply spreadsheet software in a relevant accounting/ /business context	Proficiency	Designing financial spreadsheet models Operating financial spreadsheet models	MS Excel
Presentation software (section 4.3.4)	Apply presentation software in a relevant accounting/ /business context	Ability	Designing a presentation Presenting a presentation	Powerpoint
Internet tools (section 4.3.5)	Apply internet tools in a relevant accounting/ /business context	Ability	Electronic communication and sending file attachments Accessing the internet	Outlook Internet Explorer
Research tools (section 4.3.6)	Apply professional research tools in a relevant accounting/ /business context	Ability	Searching for specific information on the internet	Search engines (e.g. Google)
Image processing software (section 4.3.7)	Ability to understand the workings of image processing software	Awareness	Scanning documents Converting documents to text	Scanning software
Accountant as a user of IT: Office management skills				
Element	***Capability***	***Level***	***Knowledge and understanding***	***Tools***
Database software (section 4.4.1)	Ability to design and use database systems	Proficiency	Designing data tables Entering, deleting, editing records Updating records Changing table structure	MS Excel or MS Access
Database search and retrieval (section 4.4.2)	Ability to search and retrieve data from a database	Proficiency	Importing a database into Excel Sorting the data Using data query tools (filter) Retrieving specific information (filter, lookup) Performing calculations Summarising information according to specific criteria (d-functions, data tables, graphs)	MS Excel
Accounting software (section 4.5.1)	Ability to understand workings of an accounting package	Ability	Installation and set-up Set-up of accounts Recording transactions Extracting reports Periodic processing Exporting data Programmed controls	Pastel/ Quickbooks/ Accpac
Tax return preparation software (section 4.5.2)	Ability to use tax return preparation software to capture and record relevant information	Ability	Identifying sources of income and deductions Calculating tax using tables and schedules Filing completed return	MS Excel
Time management	Ability to use time	Ability	Capturing information about activity	MS Excel

and billing systems (section 4.5.3)	management and billing systems in capturing, managing, billing and reporting time spent on professional duties		and time Extracting/compiling billing report	
Knowledge work systems (e.g. groupware; workflow systems; expert systems) (section 4.5.4)	Ability to work with knowledge work systems to aid accountants in the creation, integration and communication of knowledge	AbilityAwareness	Working with groupware in sharing and communicating information among different users	MS Office
Accountant as a user & evaluator of IT: Audit automation skills				
Element	***Capability***	***Level***	***Knowledge and understanding***	***Tools***
Electronic working paper (section 4.6.1)s	Ability to use software that can generate trial balances and lead schedules for the recording of evidence in the audit	Ability	Developing a spreadsheet model to extract trial balance and financial statements and record adjusting journal entries	MS Excel
Audit software (section 4.6.2)	Ability to use audit software to access client computer files, extract relevant data and perform audit functions	Proficiency	Accessing and exporting data files to audit software Manipulating the data using audit techniques; p Performing calculations Compiling and printing reports	MS Excel
Test data (section 4.6.3)	Ability to generate and use test data to test a computer application	Ability	Generating a set of test data Entering test data in application program Compiling working papers Evaluating results Using integrated test facility	MS Excel/ / Pastel
Simulation software (section 4.6.4)	Ability to understand the workings of simulation modules in order to evaluate the logic of a computer application	Awareness	Creating a simulated version of an aspect of the program Using test data to evaluate the simulation and application	MS Excel/ Pastel
Flow charting/data modelling (section 4.6.5)	Ability to use software that uses the source code version of an application to produce flow charts of the program logic	Ability	Using software to create flow chart of the logic of an application	MS Excel
Audit modules (section 4.6.6)	Ability to understand the use of embedded audit modules (including real-time audit modules) that are incorporated into an application program	Awareness	Embedded data collection Tagging Real-time notification Exception reporting	MS Excel/ / Pastel
Accountant as a manager, evaluator and designer of new technology				
Element	***Capability***	***Level***	***Knowledge and understanding***	***Tools***
Computer-aided systems engineering tools (section 4.7.1)	Ability to use CAATs CASE tools in designing new accounting systems or spreadsheet models	AbilityAwareness	Creating system documentation consisting of program flow charts, the testing of a system/model and system and user documentation	MS Office (Word, Excel and Powerpoint)
Client/server environment (section 4.7.2)	Ability to function in a co-operative client/server environment using local area networks	Ability	Logging onto the network Requesting services from the 'server'	Local LAN Share files over network
Electronic data interchange (section 4.7.3)	Understanding EDI (traditional and web-based) transactions Ability to perform EFT transactions	Awareness	The difference between EDI using private network and web based-XML Awareness of management and security issues surrounding EDI EFT issues (with banks)	Transactions using internet (banks, SARS)
Digital	Ability to understand digital	Awareness	Different communication channels	E-mail

communications (section 4.7.4)	communications (including wireless communications)		re speed (bandwidth, baud rate) and accuracy Wireless communication	EDI Internet
Network configurations (section 4.7.5)	Ability to understand various network configurations (internal and external)	Awareness	Understanding management, usage, security issues in using LAN, WAN, and internet	Local LAN, internet
Application service providers (section 4.7.6)	Ability to understand the issues around the management of application service providers	Awareness	Understanding the management and security issues in using application service providers	Use of examples
Internet service providers (section 4.7.7)	Ability to understand the issues around the management of internet service providers	Awareness	Understanding the management and security issues in using internet service providers.	Local university as ISP
Anti-virus software (section 4.8.1)	Ability to understand the use of anti-virus software to protect computer systems from infections	Awareness	Understanding the importance of installing and maintaining anti-virus software on all systems	
Encryption software (section 4.8.2)	Ability to understand the use of encryption software to change data using some type of encoding/decoding algorithm	Awareness	Understanding the use of secure sockets overlay technology (SSL) and the use of digital keys for encryption	Visit websites using these technologies
Firewall software/hardware (section 4.8.3)	Ability to understand the use of security technology to enforce an access control policy between networks	Awareness	Understanding the use and management of firewall technology in protecting networks	
User authentication (section 4.8.4)	Ability to understand the use of software and devices to identify system users	Awareness	Using a combination of devices and software to gain access to computer facilities and networks, including physical and logical authentication	Use of the university's computer facilities
Intrusion detection and monitoring (section 4.8.5)	Ability to understand the use of security technology to identify unauthorised requests for services	Awareness	Understanding the use and management of intrusion detection and monitoring software to ensure the proper functioning of a network	
Back-up and recovery (section 4.8.6)	Ability to understand the use of technology for back-up and recovery procedures to ensure continuity of IT services	Awareness	Making back-ups of important files Recovering data from a back-up file	Microsoft Windows
Agent technologies (section 4.8.7)	Ability to understand the use of programmed modules that are given certain levels of authority and autonomy to act on behalf of a supervisor	Awareness	Using agents in performing certain tasks (wizards or e-mail filtering agents)	Microsoft Office Outlook
Data warehousing and data mining (section 4.8.8)	Ability to understand the use of data warehousing and extracting trends and patterns using data mining techniques	Awareness	Copying data to one data table in a standardised format Analysing the data using statistical and other functions	Excel

4.10 Application of the IT skills framework

The framework in table 4.2 could be used by educators to ensure that the required IT skills are covered by the various courses that are offered to students. A number of these IT skills can be acquired by students when they use the information systems infrastructure of the university they attend. For example, students at University X

gain access to the university's computer network, which offers LAN services (like access to their academic record, printing, storage on the network and intranet services as well as access to the internet). Each student gets is assigned a unique login name and password and gains access to the computer facilities by using his/her student card and then logs onto the university's network using his/her unique login name and password. Students pay for any printing done (per page) as well as for accessing the internet. Students also get a unique e-mail address. They are allowed to pay university fees, internet fees and printing fees using EFT. In utilising the above computer infrastructure, students can acquire the following IT skills:

- *Client/server environmenenvironment (section 4.7.2t)*: Ability to function in a cooperative client/server environment using local area networks.
- *Electronic data interchange (section 4.7.3):* Ability to perform EDI- and EFT-transactions.
- *Digital communications (section 4.7.4)*: Ability to understand digital communications.
- *Network configurations (section 4.7.5)*: Ability to understand various network configurations.
- *Internet service providers (section 4.7.7)*: Ability to understand the issues around the management of internet service providers.
- *Anti-virus software (section 4.8.1)*: Ability to understand the use of anti-virus software to protect computer systems from infections.
- *Encryption software (section 4.8.2)*: Ability to understand the use of encryption software.
- *Firewalls (section 4.8.3)l*: Ability to understand the use of security technology to enforce access control between networks.
- *User authentication (section 4.8.4):* Ability to understand the use of software and devices to identify system users.
- *Back-up and recovery (section 4.8.5):* Ability to understand the use of technology for back-up and recovery procedures.

However, for students to fully understand these issues, lecturers should cover the theoretical content of these issues in formal lectures.

Other IT skills as listed in table 4.2 can be acquired by students following dedicated information systems modules that include practical assignments to be completed in the computer facility of the institution. A first-year course that aims to introduce students to computer systems and applications typical could cover the following skills:

- Operating systems (section 4.3.1)
- Word processing (section 4.3.2)
- Spreadsheet softwares (section 4.3.3)
- Presentation software (section 4.3.4)
- Internet tools/software (section 4.3.5)
- Professional rResearch tools (section 4.3.6)
- Image processing software (section 4.3.7)
- Design and use of a database (section 4.4.1)atabase software

Dedicated courses specifically designed for accounting students that address the use of information systems by accountants could cover the following IT skills:

- Database search and retrieval (section 4.4.2)
- Data warehousing and data mining (section 4.8.8)
- Business accounting software (section 4.5.1)Accounting software
- Knowledge management systems (section 4.5.4)work systems
- Computer-aided systems engineering software (section 4.7.1)tools
- Application service providers (section 4.7.6)

Some IT skills are best taught through integration with other subjects and could include practical assignments on:

- Tax return preparation software (section 4.5.2) (integration with Tax module)
- Time management and billing systems (section 4.5.3) (integration with Auditing module)
- Database search and retrieval (section 4.4.2) (integration with Management Accounting)
- Data warehousing and data mining (section 4.8.8) (integration with Management Accounting)

- Business aAccounting software (section 4.5.1) (integration with Financial Accounting, Tax, Management Accounting, Auditing)
- Electronic working papers (section 4.6.1) (integration with Auditing module)
- Generalised aAudit software (section 4.6.2) (integration with Auditing module)
- Test data (section 4.6.3) (integration with Auditing module)
- Simulation software (section 4.6.4) (integration with Auditing module)
- Flowcharting/data modelling software (section 4.6.5) (integration with Auditing module)
- Embedded aAudit modules (section 4.6.6) (integration with Auditing module)
- Intrusion detection and monitoring (section 4.8.5) (integration with Auditing module)

4.11 Conclusion

Accountants are required to be competent in using information technology. To acquire the skills to use information technology, students are required in their training education to perform these skills by using relevant software tools to solve business-related problems. This chapter has addressed investigative question 3 4 (section 1.118.3) to compile a comprehensive framework identifying the IT skills needed by trainee accountants, together with a description of how these skills can be taught to students using the various tools that the accountant will most probably encounter in a work situation in South Africa. This framework can be used by those responsible for the training education of accountants in South Africa to ensure that when the students enter the profession as trainee accountants, they have acquired the necessary IT skills to be able to perform their jobs competently.

However, for this framework to be used effectively, educators must ensure that students perform the functions described themselves (hands-on), using business related problems. By integrating the IT skills with the other professional subjects required (for example external financial reporting, managerial accountancy and financial management, taxation, and auditing and corporate governance) and using

these subjects to identify typical business problems, the students' knowledge and understanding of that subject can also be enhanced.

Students are educated through formal academic study (typically four years at a university) and three years of practical training (at an auditing firm or approved business organisation). At the point where students have completed their formal education and are accepted as trainee accountants, they need to possess the IT skills as listed in table 4.2. During the practical training phase of the education of accountants, training firms should ensure that these IT skills are developed further so that their trainee accountants acquire a higher level of competence. For example, where trainee accountants are required to be *proficient* in the use of spreadsheet software, accountants entering the profession as professional accountants should have *mastered* the use of spreadsheet software.

The framework in table 4.2 can be used as the benchmark for educators to set in the education of their students to make them competent in the use of technology. In the next section of this research, an analysis of the existing position regarding the training education of professional accountantsstudents at South African universities will be conducted by comparing what is currently taught to students to the IT skills framework. The IT skills that are currently taught will be investigated to identify strengths of current methods of teaching but also to identify any shortcomings and make recommendations.

Chapter 5
Analysis of current IT training education at South African universities

5.1 Introduction

In the previous chapter a comprehensive framework for the critical IT skills required of accountants was developed. Accountants in South Africa are educated through four years of formal academic study and three years of practical training. By the end of the formal training, students entering the profession as trainee accountants should possess the IT skills as listed in table 4.2. However, currently there is no formal study or information available on which of the elements of this framework students are exposed to whilst studying at the different universities. This may result in students entering the profession as trainee accountants without possessing some of the IT skills necessary to perform their job competently or possess skills not required by the business environment.

The purpose of this chapter is to address investigative question 4 5 (section 1.118.4), which aims to determine the extent to which students currently studying accountancy at South African universities will be able to acquire the IT skills as listed in table 4.2 to be competent in using information technology. Through this analysis, the shortcomings and strengths of current education practices followed at South African universities will be identified and discussed in order to propose strategies. to improve the education offered to students.

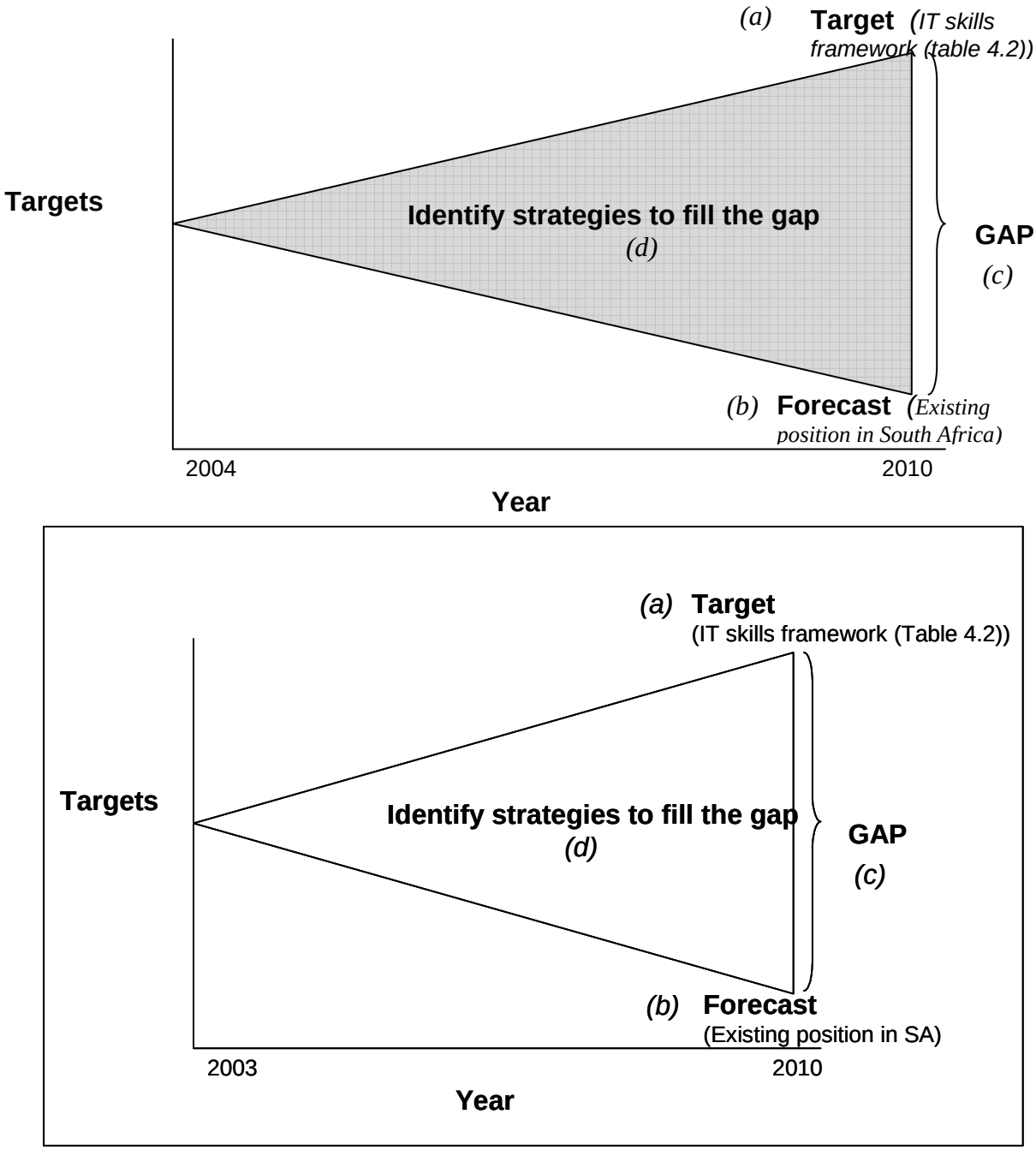
In the first part of this chapter the research methodology that will be used to address the research question will be discussed, followed by a detailed analysis of the current position at South African universities in order to identify strengths and weaknesses in the teaching education of IT skills in South Africa. Recommended strategies will be discussed in Chapter 6..

5.2 Methodology

In order to address investigative question 45, a gap analysis will be conducted to determine the current position regarding the formal training education of professional

accountants in South Africa. The purpose of a gap analysis is to establish the targets for achievement over the planning period, and then to establish what the achievements would be if nothing is done to change the current way of doing things. The difference between the targets and the extrapolated current strategies is the gap. New strategies will then have to be developed, which will be sufficient to close this gap, so that the targets can be achieved over the planning period (Goodstein, Nolan & Pfeiffer, 1993:27). Figure 5.12 depicts the gap analysis that will be conducted.

Figure 5.1: Gap analysis



The IT skills framework as developed in chapter 4 (table 4.2) forms the benchmark (objective) for what is required from newly qualified trainee accountants regarding information technology (figure 5.1(a)).

In this chapter a position audit will be conducted to investigate the current position in South Africa regarding the teaching of IT skills to students. The strengths and, weaknesses, opportunities and threats (SWOT analysis) of teaching information skills

to the students at the various universities will be investigated and analysed. All the universities that are accredited with SAICA will be investigated by analysing their curricula, departmental structures and methods of teaching information technology-related concepts. This will be done through a detailed analysis of published documentation available from these universities. The results of the analysis of the strength and weaknesses findings of the SWOT analysis (figure 5.1(b)) will be compared to the objectives as identified in figure 5.1(a) to determine the extent of the gap.

In order to close the gap as identified in figure 5.1(c), strategies that universities can adopt will be identified and discussed in the next chapter.

5.2.1 *Goal Objective and sample for survey document analysisresearch*

The goal objective of the survey document analysisresearch is to determine the current position regarding the education provided to accounting future studentsaccountants by accredited South African universities with respect to the IT skills as listed in table 4.2.

The population that was surveyed included all the South African universities that are accredited with SAICA (see table 5.1).

Table 5.1: Universities offering SAICA accredited accounting programmes (2005b)

UNIVERSITY	DEPARTMENT/SCHOOL
North-West University: Potchefstroom campus	School of Accounting Sciences
Rhodes University	Department of Accounting
University of Cape Town	Department of Accounting
University of Johannesburg	Department of Accounting
University of KwaZulu-Natal	School of Accounting and Finance
University of Port Elizabeth (renamed to Nelson Mandela Metropolitan University)	Department of Accounting
University of Pretoria	Department of Accounting
University of South Africa	Department of Applied Accountancy
University of Stellenbosch	Department of Accounting
University of the Free State	Centre for Accountancy

University of the Western Cape	Department of Accounting
University of the Witwatersrand	School of Accountancy

Source: SAICA (2005b)

Because the population is very small (consisting of 12 universities), tThe whole population was selected to be included in the sampleanalysis. Within the sample, sSpecial care was required to ensure that the most recent information and syllabi curricula were obtained from the various institutions.

5.2.2 *Research instruments*

A rResearch instruments had to be designed to conduct the research. For the purpose of this research, a structured checklistquestionnaire (appendix 1) was developed. The data was collected using information available on the courses and modules of all the universities that was in printed format as well as on the internet web sites of the institutions.[1]

•Analysis of course material

Universities supply information about their course material to students via a variety of mediums. General information about the university and the courses offered is published on the web site of the university. Some universities also supply detailed course information on their web sites. Detailed information about specific course material is made available to students as part of their study texts, as separate printed information about the course handed out to students or as material available to registered students on the intranet of the university.

All available course material of the various accredited universities was analysed to complete the questionnairechecklist about the IT environment and the courses offered to the accounting students.

5.2.3 *QuestionnaireChecklist design*

The questionnairechecklist (appendix 1) was designed with the aim of obtaining information about the IT skills acquired by the accounting students through their formal academic studies at the universitiesy. The questionnairechecklist was divided into different sections to ensure that all the relevant information was obtained and analysed.

[1] Universities supply information about their course material to students via a variety of mediums. General information about the university and the courses offered is published on the web site of the university. Some universities also supply detailed course information on their web sites. Detailed information about specific course material is made available to students as part of their study texts, as separate printed information about the course handed out to students or as material available to registered students on the intranet of the university.

The first part of the questionnairechecklist aimed to obtain general information about the university and the department responsible for the training education of professional accountants. This part of the questionnairechecklist was vital in determining the way in which IT skills are taught to students by identifying who is responsible for the training education of IT, their knowledge of IT and accountancy and whether the students have access to computer facilities at the university (appendix 1 (questions A1 – A3)).

The second part of the questionnairechecklist (appendix 1, section B) aimed to obtain information about the IT environment and infrastructure at the universities to identify the exposure accounting students have to various IT infrastructures. The information obtained will give a clearer indication whether the following IT skills (as listed in table 4.2) are acquired by the accounting students:

- Client/server environment (section 4.7.2) (question B 2.B 4.1)
- Electronic data interchange (section 4.7.3) (question B 2.B 4.7)
- Digital communication (section 4.7.4) (questions B 2.B 4.4 and B 2.B 4.8)
- Network configuration (section 4.7.5) (questions B 2.B 4.1, B 2.B 4.5, B 2.B 4.6)
- Internet service provider (section 4.7.7) (question B 2.B 4.8, B 2.B 4.10)
- Anti-virus software (section 4.8.1) (question B 2.B 4.1)
- Encryption software (section 4.8.2) (question B 2.B 4.7)
- Firewall software (section 4.8.3) (question B 2.B 4.9)
- User authentication (section 4.8.4) (questions B 2.B 4.2, B 2.B 4.3)

The third part of the questionnairechecklist (appendix 1, section C) aimed to collect information about the various courses/modules offered by the institution that require students to do practical assignments on the computer. Information was collected about all the dedicated IT courses/modules, the year in which it is offered, the duration of the course, the credit weighting of the subject and the total amount of credits in the year of study of all the subjects. This information will allow the analysis of the depth of study of specific IT skills. Question C62 (appendix 1) collected information about the professional subjects taught to students during their first three year of study at their institution (Financial Accounting, Auditing, Management Accounting, Taxation, and Information Technology) and the relative credit weighting

for each of these subjects. This information will allow an analysis of the relative time and importance placed on the teaching of information technology at the universities.

The fourth part of the questionnairechecklist (appendix 1, section D) listed all the critical IT skills as defined in table 4.2 and required a detailed analysis of the IT syllabi curriculum offered by the institution to determine which of these IT skills are covered by the institution.

All the information collected was used in conducting the gap analysis to determine the current IT skills taught by South African universities and is important in determining the gap between the IT skills as described in table 4.2 and the current position at universities.

5.2.4 *Survey*

The information required from the various universities for analysis was extracted from published information available from the course/ module material, yearbooks and information on the web sites of these universities.

5.3 Results

The various courses offered by the universities accredited with SAICA were evaluated by analysing the information contained in their yearbooks as well as using information published on the internet.

Information technology courses are offered by various departments and faculties at the various selected universities. The following universities were included in the analysis and the information obtained from the sources as indicated:

North-West University: Potchefstroom campus (2005)
Rhodes University (2005)
University of Cape Town (2005)University of Johannesburg (2005)
University of Johannesburg (2005)University of Cape Town (2005)
University of KwaZulu-Natal (2005)
University of Port Elizabeth (renamed to Nelson Mandela Metropolitan University) (2005)
University of Pretoria (2005)

University of South Africa (2005)
University of Stellenbosch (2005)
University of the Free State (2005)
University of the Western Cape (2005)
University of the Witwatersrand (2005)

5.3.1 *Department responsible for IT training education at universities*

The analysis of the courses offered at universities shows that 50% of universities use their own department/school/centre of accountancy to teach information technology courses to their students. By using accountants to teach information technology to students, universities can ensure that the IT skills are taught using accounting and business-related problems (as required in table 4.2). Thirty-three per cent of universities use the staff at a department of information situated within the economic and management sciences faculty. Although these personnel are not necessarily accountants, they should be aware of the business context and could include business-related problems in teaching the IT skills to the students. However, two universities (17%) still use the services of a department of computer science (situated in a faculty outside of economic and management sciences). This could result in accounting students not acquiring the IT skills required within a business/accounting context and/or being taught IT skills that are not relevant to accountants (for example programming skills).

5.3.2 *IT infrastructure at South African universities*

Some of the IT skills identified in table 4.2 can be acquired by students using the IT facilities at their university. An analysis of the facilities at the accredited South African universities reveals that:

- all universities use computer facilities that are connected via local area networks, with students having access to this network through computer user areas;
- students are issued with magnetic cards (student identification cards) that have to be used to gain access to the computer user areas;
- all students are issued with a login name and password that have to be used to access the network of the university;

- students are supplied with a university e-mail address and have access to the internet via the university network, although some students have to pay when using the internet; and
- students are allocated network space on which they can save information.

More than 80% of the universities surveyed allow students to have access to detailed course material, individual progress and account information through the local intranet. This information is supplied in a secure environment requiring students to log on to the system with valid credentials. A minority of universities (less than 30%) currently allow students to perform transactions with the university through the local area network (for example on-line registration and electronic payment of accounts).

Although a number of critical IT skills are acquired by students when interacting with the information technology facilities offered by the universities (see table 5.2), lecturers should make students aware of the issues (for example management and security issues) around these skills with reference to a business and/or accounting context.

Table 5.2: IT skills acquired by using the computer facilities at universities

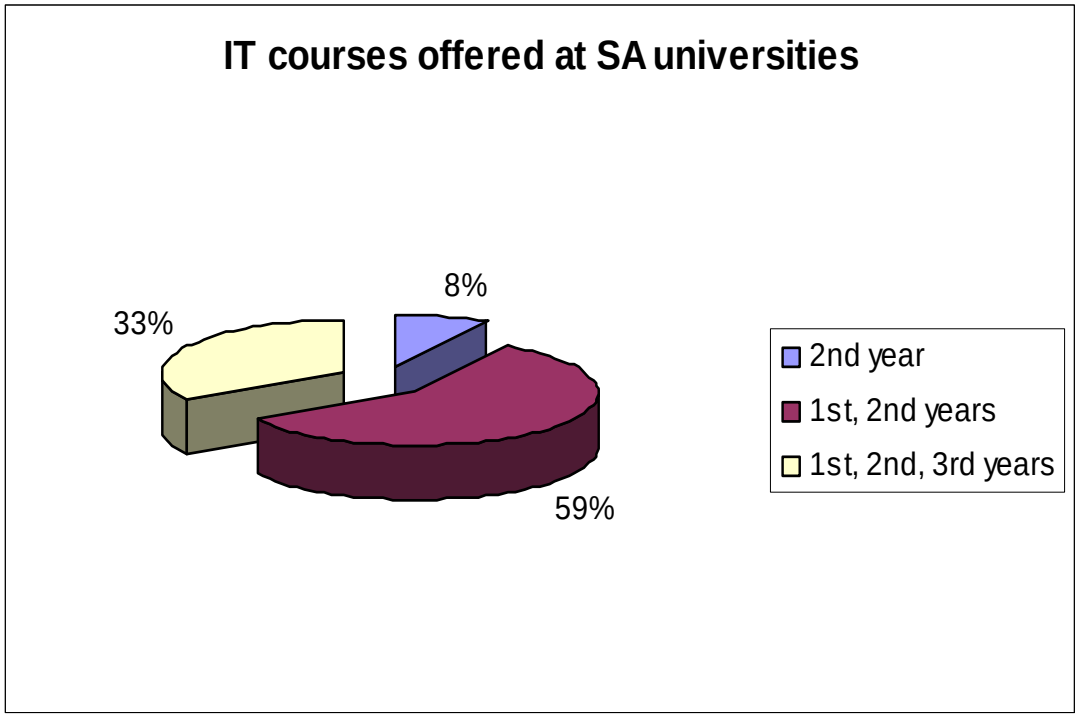
IT SKILLS				
Client/server environment	Ability to function in a co-operative client/server environment using local area networks	Ability	Logging onto the network Requesting services from the 'server'	Local LAN Share files over the network
Electronic data interchange	Understand EDI (traditional and web based) transactions Ability to perform EFT transactions	Awareness	The difference between EDI using private network and web-based XML Aware of management and security issues surrounding EDI EFT issues	Transactions using internet (banks, SARS)
Digital communications	Ability to understand digital communications (including wireless communications)	Awareness	Different communication channels re speed (bandwidth, baud rate) and accuracy Wireless communication	E-mail EDI Internet
Network configurations	Ability to understand various network configurations (internal and external)	Awareness	Understand management, usage, security issues in using LAN, WAN, and internet	Local LAN, internet
Internet service providers	Ability to understand the issues around the management of internet service providers	Awareness	Understand the management and security issues in using internet service providers.	Local university as ISP
Firewall software/hardware	Ability to understand the use of security technology to enforce an access control policy between networks	Awareness	Understand the use and management of firewall technology in protecting a network	

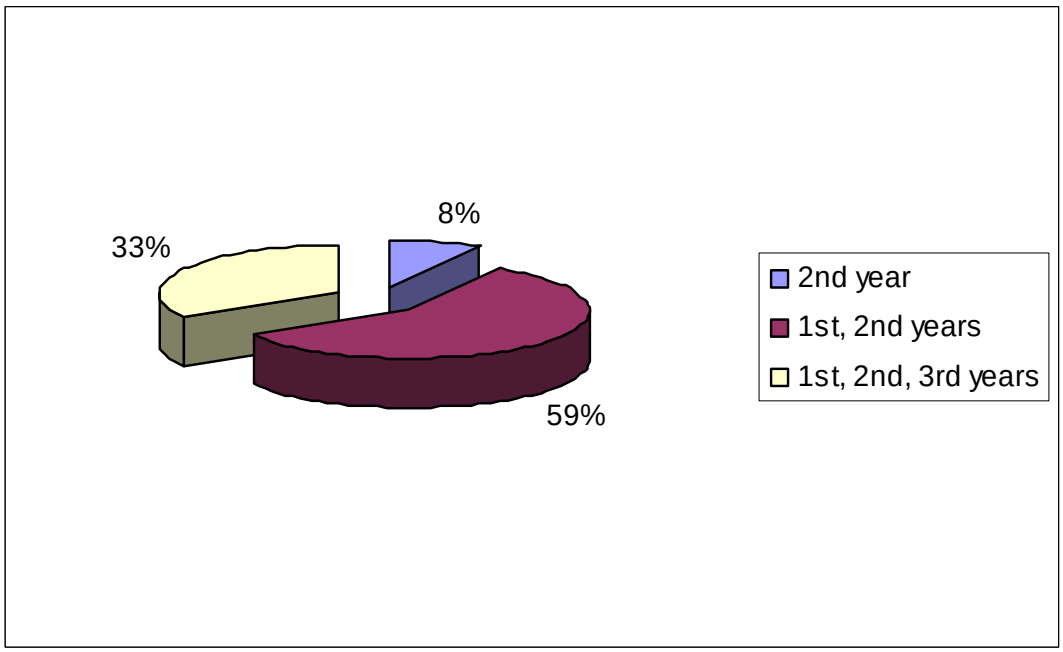
User authentication	Ability to understand the use of software and devices to identify system users	Awareness	Using a combination of devices and software to gain access to computer facilities and networks, including physical and logical authentication	Use of the university's computer facilities
Back-up and recovery	Ability to understand the use of technology for back-up and recovery procedures to ensure continuity of IT services	Awareness	Making back-ups of important files Recovering data from a back-up file	Microsoft Windows

5.3.3 *Spread of IT courses offered by South African universities*

When the various courses and modules offered to accountancy accounting students were analysed, it was determined that 83% of the universities offer some sort of computer literacy course in the first year of study, with all the universities offering a business information systems course (or similar) in the second year of study. Four universities also include practical information systems courses in the third year of study with no university offering any practical information systems courses in the fourth year. Figure 5.2 depicts how the various universities offer information systems courses in their curriculum.

Figure 5.2: Spread of IT courses offered at universities





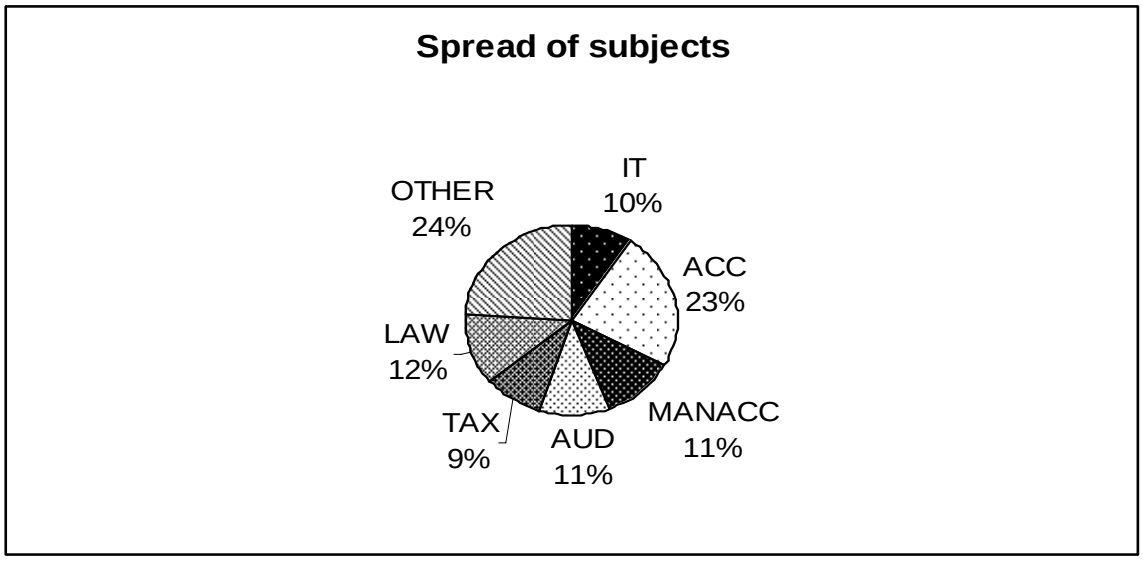
At least 92% of universities offer a first and second-year Information Technology course (with 33% of these universities also offering a third-year course) to their students, with 8% of universities offering it only in the second year. Students' acquisition of IT skills within a business and accounting context could be hampered, Aas most of the professional subjects are introduced only in the second or third year of study (e.g. Management Accounting, Auditing and Taxation), universities that do

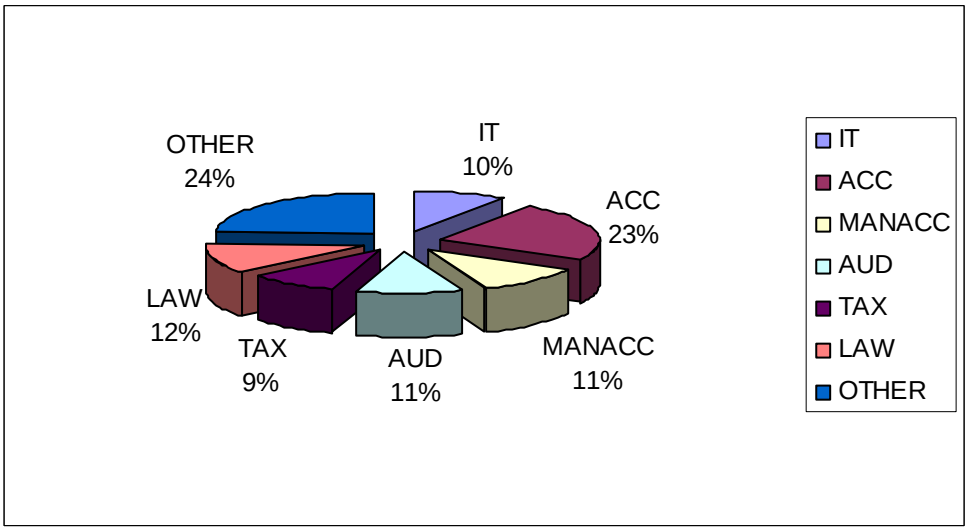
not offer any IT exposure to their students in the third or fourth year of studies may hamper their students' ability to acquire the skills within a relevant business and accounting context. Some IT skills as listed in table 4.2 could only be taught to these students in their third and/or fourth year of study (especially audit and management-related IT skills).

5.3.4 *Relative weighting of IT courses in relation to other professional subjects*

On average universities spend 10% of the total credits in the accounting curriculum (the first three years of study) on information systems-related subjects. Figure 5.3 depicts the spread of credits per subject for the accredited universities during the first three years of study.

Figure 5.3: Spread of subjects during first three years of study





From this graph it is deduced that on average universities spend more or less equal time on Information Technology (IT), Auditing (AUD), Management Accounting (MANACC), Taxation (TAXC) and Law (LAW) subjects during the first three years of study (9% to 12%). The 24% of time allocated to other subjects (OTHER) is mostly first-year subjects of a general nature (for example Statistics, Economics, Business Management, Communication, etc.). Most of the time is allocated to the study of Financial Accounting (23%).

However, the coverage of these subjects within the universities differs substantially. In table 5.23 the relative coverage of the various subjects of the accredited universities is compared to the average. In order to obtain an overall picture of the

spread of subjects per university rather than comparing individual universities with one another, the names of the universities were replaced by an alphabetical letter.

Table 5.23: Spread of subjects per university (first three years of study)

	TOTALAVERAGE	a	b	c	d	e	f	g	h	i	j	k	l
IT	**9,5%**	8,9%	7,4%	14,3%	8,0%	15,4%	10,3%	5,7%	8,8%	11,2%	10,4%	10,0%	4,2%
ACC	**23,3%**	21,4%	22,2%	21,4%	24,0%	23,1%	25,8%	21,1%	23,5%	22,3%	19,2%	30,0%	25,0%
MANACC	**11,2%**	14,3%	18,5%	7,1%	12,0%	7,7%	7,7%	15,8%	11,8%	10,3%	11,2%	10,0%	8,3%
AUD	**10,7%**	10,7%	14,8%	7,1%	8,0%	7,7%	7,7%	15,8%	14,7%	10,3%	12,8%	10,0%	8,3%
TAX	**8,9%**	7,1%	7,4%	7,1%	4,0%	7,7%	6,2%	15,8%	8,8%	12,9%	11,2%	10,0%	8,3%
LAW	**12,0%**	8,9%	11,1%	14,3%	12,0%	7,7%	12,4%	11,4%	11,8%	15,5%	9,6%	12,5%	16,7%
OTHER	**24,4%**	28,6%	18,5%	28,6%	32,0%	30,8%	29,9%	14,5%	20,6%	17,6%	25,6%	17,5%	29,2%

From this table it can be deduced that universities have diverse opinions about the relative weightings of the various subjects, with some universities introducing some of the subjects (for example Taxation and Auditing) only in the third year of study. The relative weighting of IT education at the selected universities varies between 4% and 15% highlighting the diverse opinion that exist amongst universities on the importance of IT education for their students.

If it is assumed that on average 10% of the first three years of study is dedicated to Information Technology, the question arises as to **what** is currently being taught to the students by the universities regarding information technology by the universities.

5.3.5 *IT skills taught by the universities*

An analysis of the detailed Information Technology syllabi curricula as published by the universities revealed that the following IT skills are covered by all the universities in their existing IT-related subjects:

- Operating systems (section 4.3.1)
- Spreadsheets (section 4.3.3)

The following IT skills are included in the IT-related subjects by more than 80% of the universities:

- Word processing (section 4.3.2)
- Presentation software (section 4.3.4)

- Internet and e-mail (section 4.3.5)
- Database software (section 4.4.1)
- Business aAccounting software (section 4.5.1)

The following IT skills are covered by some universities, although by less than 33% of South African universities:

- CASE tools (section 4.7.1)
- Database search and retrieval (section 4.4.2)
- Audit software (section 4.6.2)
- Research tools (section 4.3.6)
- Programming

Some audit software IT skills (section 4.6.2) are included in the curriculum of three of the universities (25%).

A number of universities include some of the IT skills listed above in their curricula but either discusses it in class or demonstrates the working of it in class (more on a knowledge level) but do not require their students to apply these skills by performing the action themselves using technology. For students to acquire a skill it is important that they do it themselves.

5.3.6 Summary of existing IT skills covered by South African universities

The IT skills currently being acquired by students at South African universities were identified in the position audit. In table 5.34 these IT skills are compared with the framework of critical IT skills as determined in table 4.2 to identify strengths and weaknesses in the current South African environment. The table also includes an additional column (Action) where critical skills are awarded an indicator of 1 or 2. The purpose of this column is to indicate for each skill that is on a competence level of ability and higher, the action that is required if universities want to ensure their students acquire the level of competence as indicated. The indicators together with the action required are:

Action indicator	*Action required*
1	Critical IT skill that is covered by most universities (although a relevant business or accounting context may be lacking).
2	Critical IT skill that is not covered by most universities and that should be addressed urgently.
N/A	No action required as element only requires awareness.

Table 5.34: Critical IT skills currently taught to students

IT SKILLS				
Critical element	***Capability***	***Level***	***Current position IT skills taught byin SASouth African universities***	***Action***
Operating systems (section 4.3.1)Operating systems	Apply operating systems and utility software in a business/accounting context	Ability	100%	1
Word processing (section 4.3.2)Word processing	Apply word processing software in a relevant accounting/business context	Ability	91%	1
Spreadsheets (section 4.3.3)Spreadsheets	Apply spreadsheet software in a relevant accounting/business context	Proficiency	100%	1
Presentation software (section 4.3.4)Presentation software	Apply presentation software in a relevant accounting/business context	Ability	83%	1
Internet tools (section 4.3.5)Internet tools	Apply internet tools in a relevant accounting/ business context	Ability	91%	1
Research tools (section 4.3.6)Research tools	Apply professional research tools in a relevant accounting/business context	Ability	25%	2
Image processing software (section 4.3.7)Image processing software	Apply image processing software in a relevant accounting/business context	Awareness	0%	N/A
Database software (section 4.4.1)Database software	Ability to design and use database systems	Proficiency	83%	1
Database search and retrieval (section 4.4.2)Database search and retrieval	Ability to search and retrieve data from a database	Proficiency	25%	2
Accounting software (section 4.5.1)Accounting software	Ability to understand workings of an accounting package	Ability	83%	1
Tax return preparation software (section 4.5.2)Tax return preparation software	Ability to use tax return preparation software to capture and record relevant information	Ability	0%	2
Time management and billing systems (section 4.5.3)Time management and billing systems	Ability to use time management and billing systems in capturing, managing, billing and reporting time spent on professional duties	Ability	0%	2
Knowledge work systems (e.g. groupware; workflow systems; expert systems) (section 4.5.4)Knowledge work systems (e.g. groupware; workflow systems; expert systems)	Ability to work with knowledge work systems to aid accountants in the creation, integration and communication of knowledge	Awareness	0%	N/A

Electronic working paper (section 4.6.1)Electronic working papers	Ability to use software that can generate trial balances and lead schedules for the recording of evidence in the audit	Ability	170%	2
Audit software (section 4.6.2)Audit software	Ability to use audit software to access client computer files, extract relevant data and perform audit functions	Proficiency	25%	2
Test data (section 4.6.3)Test data	Ability to generate and use test data to test a computer application	Ability	0%	2
Simulation software (section 4.6.4)Simulation software	Ability to create simulation modules in order to evaluate the logic of a computer application	Awareness	0%	N/A
Flow charting/data modelling (section 4.6.5)Flowcharting/data modelling	Ability to use software that uses the source code version of an application to produce flowcharts of itsthe program logic	Ability	0%	2
Audit modules (section 4.6.6)Audit modules	Ability to use embedded audit modules (including real-time audit modules) that are incorporated into an application program	Awareness	0%	N/A
Computer-aided systems engineering tools (section 4.7.1)Computer-aided systems engineering tools	Ability to use computer-aided systems engineering tools in designing new accounting systems or spreadsheet models	Awareness	25%	N/A
Client/server environment (section 4.7.2)Client/server environment	Ability to function in a co-operative client/server environment using local area networks	Ability	100%	1
Electronic data interchange (section 4.7.3)Electronic data interchange	Ability to perform EDI (traditional and web based) transactions	Awareness	0%	N/A
Digital communications (section 4.7.4)Digital communications	Ability to understand digital communications (including wireless communications)	Awareness	80%	N/A
Network configurations (section 4.7.5)Network configurations	Ability to understand various network configurations (internal and external)	Awareness	100%	N/A
Application service providers (section 4.7.6)Application service providers	Ability to understand the issues around the management of application service providers	Awareness	0%	N/A
Internet service providers (section 4.7.7)Internet service providers	Ability to understand the issues around the management of internet service providers	Awareness	100%	N/A
Anti-virus software (section 4.8.1)Anti-virus software	Ability to understand the use of anti-virus software to protect computer systems from infections	Awareness	0%	N/A
Encryption software (section 4.8.2)Encryption software	Ability to understand the use of encryption software to change data using some type of encoding/ decoding algorithm	Awareness	0%	N/A
Firewall software/hardware (section 4.8.3)Firewall software/hardware	Ability to understand the use of security technology to enforce an access control policy between networks	Awareness	80%	N/A
User authentication (section 4.8.4)User authentication	Ability to understand the use of software and devices to identify system users	Awareness	100%	N/A
Intrusion detection and monitoring (section 4.8.5)Intrusion detection and monitoring	Ability to understand the use of security technology to identify unauthorised requests for services	Awareness	0%	N/A
Back-up and recovery (section 4.8.6)Back-up and recovery	Ability to understand the use of technology for back-up and recovery procedures to ensure continuity of IT services	Awareness	80%	N/A
Agent technologies (section 4.8.7)Agent technologies	Ability to understand the use of programmed modules that are given certain levels of authority and	Awareness	0%	N/A

	autonomy to act on behalf of a supervisor			
Data warehousing and data mining (section 4.8.8)Data warehousing and data mining	Ability to understand the use of data warehousing and extracting trends and patterns using data mining techniques	Awareness	0%	N/A

Although this table gives an indication of the strengths and weaknesses of the current position at universities in South Africa, it does not address the issue of depth and relevance of the various IT skills, but only whether it is covered at all by the universities. The critical IT skills that are currently not being addressed sufficiently at South African universities (that is by less than 75% of universities) and that are deemed as critical (ability level and higher) and that should be addressed by universities, are:

On a proficiency level

- Research tools
- Image processing software
- Database search and retrieval (section 4.4.2)
- Audit software (section 4.6.2)Tax return preparation software
- Time management and billing systems
- Knowledge work systems
- Electronic working papers
- Audit software
- Test data
- Simulation software
- Flowcharting/ data modelling
- Audit modules
- Computer-aided systems engineering tools
- Electronic data interchange
- Application service providers
- Anti-virus software
- Encryption software
- Intrusion detection and monitoring
- Agent technologies
- Data warehousing and data mining

On an ability level

- Research tools (section 4.3.6)
- Tax return preparation software (section 4.5.2)
- Time management and billing systems (section 4.5.3)
- Electronic working papers (section 4.6.1)
- Test data (section 4.6.3)
- Flowcharting/ data modelling (section 4.6.5)

Universities need to ensure that those IT skills that are indicated in table 5.3 as being covered in the curricula of universities, are taught using relevant business and accounting contexts and to the required competence level.

5.4 Conclusion

In this chapter, a position audit was conducted to investigate the current position regarding the training education of students at South African universities in IT skills. Although 50% of universities use accountants to teach the IT skills to students, 50% of universities use other professionals (for example scientists, programmers and business academics) to teach these subjects. This can have a severe impact on the competency of students in the use of IT skills in a relevant business and/or accounting context.

All the universities surveyed allow their students to use computer facilities that are set up in a networked environment. Students gain a number of critical IT skills when using these facilities. However, lecturers should still explain to students the issues involved in these skills and how they apply to business organisations.

On average, universities allocate 10% of the total tuition time during the first three years to studies on IT-related topics. This compares favourably with the time allocated to some of the other professional subjects (e.g. management accountancy and financial management, auditing and taxation). However, most (or all) of the time allocated to IT training education falls during the first two years of study. This may hamper students in gaining the required level of IT skills in some areas, as most of the professional subjects are introduced only in the second (or third) year of study.

Students need to master the theory of these subjects before they can apply it by using IT as a tool.

The 10% of time allocated to IT training education includes the coverage of the theoretical component of the syllabus, as well as the practical assignments (covering the IT skills). Most universities spend less than 50% of their IT courses on practical assignments, with most of the emphasis being placed on the acquisition of IT skills in the use of the Microsoft Office Suite (Word, Excel, Powerpoint) and accounting packages (e.g. Pastel).

Other related IT skills (in Auditing, Management Accounting and Taxation) are not covered by a significant number of universities, nor is their any evidence of universities currently integrating IT skills with the professional subjects.

When the current position in South Africa regarding the IT training education of accounting students is analysed, the strengths of the IT training education can be summarised as follows:

- Sufficient time is allocated to IT training education during the first three years of study (10%).
- The universities all employ a networked infrastructure, allowing students to get obtain exposure in to functioning in a networked environment.
- Students get obtain exposure in the use of accounting packages.
- Students get obtain exposure in the use of the Microsoft Office Suite.

The weaknesses in the current position in South Africa regarding the IT training education of professional accounting studentsants are:

- Students are not sufficiently exposed to IT skills in their third and fourth year of study at the university.
- IT is not sufficiently integrated with the other professional subjects.
- Some universities do not use professional accountants to train educate their students, resulting in skills acquired without using a relevant business/accounting context.

- A number of critical IT skills are not covered by South African universities (relating to auditing skills, database search and retrieval, research tools, electronic working papers, and tax return software, time management and billing systems, test data and flow charting/data modelling).

The purpose of a gap analysis is to decide on strategies to close the gap between the current position and the target position. In the next chapter the perceptions of the universities on the implementation of an IT skills framework will be evaluated and a number of strategies will be discussed that can be used by South African universities to ensure that their students acquire the IT skills that are critical in the South African environment.

Chapter 6
Discussion Strategies foron the implementation of the critical IT skills framework

6.1 Introduction

In the previous chapter, a position audit was conducted to determine the current position in South Africa regarding the training education of accounting students at South African universities. This audit focused on the extent to which IT technology and skills are included in the curricula being taught at the universities accredited with SAICA. In this audit a number of strengths and weaknesses were identified. In this chapter tThe findings of the previous chapter will be expanded to determine the perceptions of role-players at these universities on strategies that can be employed by universities to ensure that students entering the profession as trainee accountants demonstrate the critical IT skills to be competent in the South African environment. The main purpose of obtaining the perceptions of role-players at universities is to observe the typical actions and reactions of these role-players if they were asked to implement changes to the current education offered to their students regarding information technology.

Strategic planning is defined as "the process by which the guiding members of an organisation envision its future and develop the necessary procedures and operations to achieve that future" (Goodstein, *et al.*, 1993:3). According to De Kluyver (2000:7), strategic thinking involves three principal steps: (i) "where are we now?" analysis, (ii) "where do we go?" assessment, and (iii) "how do we get there?" appraisal. Chapter 5 analysed the current position of IT training education at South African universities and then compared these findings to the critical IT skills framework as developed in chapter 4 (the "where are we now?" analysis).

The second step according to De Kluyver (2000:8) concerns the generation of strategic alternatives on the basis of the assessment in (i), resulting in a statement of strategic intent. A strategic intent is a vision statement that identifies the guiding concept or driving force that will propel the organisation forward toward the achievement of that intent.

The third step deals with detailed questions on how to achieve the desired objectives. One of the most important issues that will be addressed at this stage is how to bridge the capability gap that separates the current skills from the capabilities needed to achieve the stated strategic intent. This stage focuses on core competence building and the building of key success factors associated with successfully implementing the chosen strategy.

This chapter will firstly conduct address thea research survey that was conducted to obtain the perceptions of through personal interviews with role-players at all universities with accredited accounting programmes to confirm the “where are we now” analysis and , to identify their potential reactions and actions if they were to implement a new set of information technology skills at their institution. These responses will be of assistance in the and to identification and discussiony of strategic alternatives to in reaching the stated goal (the IT skills framework), namely the “where do we go” and “how do we get there” analysis. The chapter will conclude with a discussion on a number of these strategies that could form the basis for implementing the chosen strategic plan and that can be used in formulating intermediate and subordinate goals and plans.

6.2 Methodology

In the first four chapters a framework of critical IT skills as required of professional trainee accountants was identifiedcompiled. An analysis of the current position at South African universities was conducted in chapter 5 through a documentation analysis of published information available from these universities. The gap that was identified in chapter 5 will be investigated next to identify and discuss various strategies that can be employed to close this gap. This will be done by identifying the issues that need to be addressed to close the gap and then by testing these issues with relevant role-players at all the universities with accredited accounting programmes gap through the use of a questionnaire . A research instrument in the form of a questionnaire will be used to test the perceptions of the role-players on of the various strategic options available to them. The aims of the questionnaire will be to test the opinion of role-players of on their perception of the relevance of the IT skills framework, to determine the existing resources available to them, and to

determine how they would implement this framework if it were to become part of the prescribed syllabus. The questionnaire will not be used for empirical analysis but rather to identify the typical issues and actual and potential problems experienced by universities and academics when faced with issues about the information technology education of their students.

The questionnaire will was be sent to all the heads of departments of the universities with accredited accounting programmes (see table 5.1) with the request to forward it to the individual(s) responsible for the accounting programme at that university and/or the individual(s) responsible for the IT training education of the accounting students (appendix 2(a)).

6.2.1 *Questionnaire design*

The main objectives of the questionnaire is are to identify the perception of role-players on of the importance of including information technology education to their students, to identify strategies that can be employed by universities to implement the IT skills framework and to identify whether any impediments exist at the universities that could hamper the implementation of those strategies. The questionnaire is divided into five sections. The first section supplies background information about the research project and explains to the respondent how the IT skills framework was compiled (appendix 3 section (Aa)).

The second section obtains the perception of the various role-players of the relevance of the IT skills framework that was developed. This part of the questionnaire should give an indication of the overall perception of the importance of including IT concepts in the training education of professional accountants (appendix 3 section (Bb)).

The third section of the questionnaire gathers information about the existing skills and resources (including the time allocated to IT subjects) at universities. An understanding of the existing resources and skills would provide an indication of the impact of the implementation of new strategies (appendix 3 section (Cc)) on the universities.

The fourth section of the questionnaire deals with the steps that universities foresee they need to be carryied out at the universities out if the IT skills framework is to be implemented. The questions are aimed at determining what needs to be done at each university and by whom, and how the IT skills framework could be implemented. They also try to identify problems/barriers that the respondent foresees in implementing this framework at his/her institution (appendix 3 section 3(Dd)).

The last part of the questionnaire requests personal information from the respondent (appendix 3 section (Ee)). This information is important to ensure that the respondent is the best person within his/her institution to complete the questionnaire.

To avoid or limit possible interpretation errors in the completion of the questionnaire, pre-testing was conducted using 2 academics to whom the questionnaire would be relevant (Babbie & Mouton, 2001:244). This resulted in some minor modifications to the layout and content of the questionnaire.

6.2.2 *Survey*

The questionnaire was mailed to all the heads of the departments/schools/centres with accredited accounting programmes with the request to forward it to the person responsible for the accounting programme at the institution and/or person responsible for the IT training education of the accountancy accounting students (table 6.1). The importance of completing the questionnaire was also highlighted (appendix 2(a)).

Table 6.1: Universities included in the survey

UNIVERSITY	SCHOOL
North-West University: Potchefstroom campus	School of Accounting Sciences
Rhodes University	Department of Accounting
University of Cape Town	Department of Accounting
University of Johannesburg	Department of Accounting
University of KwaZulu-Natal	School of Accounting and Finance
University of Port Elizabeth (renamed to Nelson Mandela Metropolitan University)	Department of Accounting

University of Pretoria	Department of Accounting
University of South Africa	Department of Applied Accountancy
University of Stellenbosch	Department of Accounting
University of the Free State	Centre for Accountancy
University of the Western Cape	Department of Accounting
University of the Witwatersrand	School of Accountancy

The universities returned 42% (5) of the questionnaires by mail. An e-mail message was sent to all the heads of departments at those universities that did not respond to the initial survey, with the questionnaire attached as an electronic document (appendix 2(b)). A further 33% (4) of the questionnaires were returned via e-mail. Universities that did not respond to either the posted questionnaire or the e-mail messages were contacted telephonically after the most appropriate individual to complete the questionnaire had been identified, and this person was then requested to complete the questionnaire. This resulted in the outstanding 25% (3) of questionnaires being completed and submitted electronically.

6.2.3 *Results*

All the questionnaires returned by the respondents were analysed and the results of this analysis are discussed in this section. An analysis of the profile of the respondents indicated that all the questionnaires had been completed by a senior academic staff member at the university (table 6.2) who plays an important role in the education of the professional accountants (table 6.3).

Table 6.2: Profile of respondents (seniority)

Professor	50%
Associate professor	25%
Senior lecturer	25%

Table 6.3: Profile of respondents (role in teaching of accountants)

Accounting programme co-ordinator	50%
Responsible for IT trainingIT education of accountants	42%

Involved with subjects other than IT	8%

The one respondent listed as “involved with subjects other than IT” (table 6.3) indicated that he was responsible for auditing (specialising in computer auditing). Three of the respondents (25%) were also the heads of their departments. From this analysis it is evident that the profiles of the respondents are such (seniority and the role they play in the teaching education of their students) that the answers provided in the questionnaires can be relied on with confidence.

6.2.3.1 Questions about the IT skills framework

Question 1 (appendix 3 section (Bb)) asked the respondents whether they agreed with the findings of the research that led to the formulation of the IT skills framework. If they did not agree with this framework, question 2 asked the respondents to provide reasons why they disagreed with the framework. The purpose of these two questions was to evaluate the role-players’ perceptions of the importance of IT trainingIT education for professional accountants. The result of the survey indicates that 92% of respondents agreed with the findings of this research that resulted in the IT skills framework. The one respondent who did not agree with the IT skills framework said that it was because he did not agree with some of the contents of the IFAC and the SAICA syllabi on information technology. As the overwhelming majority of respondents agreed with the findings of this research that resulted in an IT skills framework for South African accountantsaccounting students, the importance that role-players attach to the teaching of information technology and proper implementation of a relevantthis IT skills framework at South African universities is evident. The IT skills framework could therefore be used as the desired outcome of what should be achieved in ensuring that students are technologically competent.

6.2.3.2 Questions relating to the existing skills and resources available to universities

The next part of the questionnaire gathered information about the existing skills and resources available to the various universities. These findings should correlate with the documentation analysis that was discussed in chapter 5.

(a) Lecturers' skills and abilities

Question 3 (appendix 3 section (Cc)) identified the department or function within the institution that was responsible for teaching IT-related subjects at the university. This question is important because of the goal of IT trainingIT education, which states that students should gain the IT competences within business and accounting-related contexts. If departments other than the accounting department are responsible for the IT trainingIT education, the relevance of the context of the training education can be questioned. The result of the survey is displayed in table 6.4.

Table 6.4: Department/function responsible for IT trainingIT education

Accountancy department/school/centre	50%
Information department within the faculty	33%
Information/computer science department in *another* faculty	17%

In chapter 5 (section 5.3.1) the importance of using professional accountants with IT knowledge and skills to create the relevant business and accounting context for the students was emphasised. This should ensure that the students acquire the IT skills within an appropriate context. Universities are also encouraged to integrate IT with the other professional subjects. This would force the accountancy departments (schools/centres) not currently responsible for the IT trainingIT education (50% of the universities) to accept responsibility for the IT component of the accounting education especially in the later years of study (2^{nd}, 3^{rd} and 4^{th} years).

Question 4 (appendix 3(c)appendix 3 section C) asked whether the lecturers involved in the teaching of the IT component of the accounting programme had a professional accountancy qualification. This question aimed to establish whether the lecturers had the required background to teach students IT skills using business and accounting-related examples. The result of the survey indicates that 42% of universities employed lecturers with a professional accountancy qualification to teach the IT subject(s), with one university (8%) indicating that some of their IT lecturers had a professional accountancy qualification. All the universities where the accountancy department (school/centre) was responsible for the IT trainingIT education of the students used professional accountants to teach the IT component of the syllabus.

Most IT skills can only be taught to students by integrating them with the professional subjects (for example Financial Reporting, Auditing, etc). Universities can follow one of two ways of integrating IT with these subjects. One method is to use lecturers who teach dedicated IT subjects but integrate aspects of the professional subjects with the practical assignments and projects. A prerequisite for this method is that the IT lecturer must have the required background to be able to refer to the professional subjects or must be able to get assistance from the lecturers specialising in the professional subjects. Universities that employ lecturers with professional accountancy qualifications to teach IT subjects (as was determined by question 4 of the survey) would be able to follow this approach. The survey found that 50% of the universities used non-accountants in the IT trainingIT education of accountancy studentsaccounting students.

The IFAC Education Committee (2003b) states that IT skills should be acquired in relevant business and/or accounting contexts. Given this vision, universities were asked in question 5 (appendix 3(c)appendix 3 section C) whether they believed that the lecturing staff currently used to train educate the accountancy studentsaccounting students have the ability to reach the learning outcomes as listed in the IT skills framework. The survey indicated that 75% of respondents were of the opinion that their current lecturers possessed the required skills and background to ensure that students acquire the IT skills as listed in the IT skills framework. Of the universities currently using non-accountants in teaching the information technology component to their students, 67% indicated that these lecturers would be able to integrate technology using relevant business and accounting contexts. These varied and unexpected responses to this question are indicative of the ignorance that exists amongst academics on what is meant by the acquisition of IT skills. Some respondents were clearly under the impression that IT skills refer to students being trained in the use of specific software (or packages) or the use of technology rather than to the ability of students to apply their knowledge of their professional subjects in solving business and accounting problems by using information technology as a tool.

The SAICA (2003b4, 85/03) syllabus on Information Technology states that "the required competences are expected to be developed by reference to the four core syllabi, viz. external financial reporting; auditing, assurance services and corporate governance, managerial accounting and financial management; and taxation". The second approach universities can use is to let lecturers involved in the training education of the four professional subjects integrate the IT competences in the teaching of these subjects. Question 6 (appendix 3(c)appendix 3 section C) asked the respondents whether these lecturers had the ability and knowledge of IT to integrate IT competences with the contents of their professional subjects. The result of the survey indicates that 75% of respondents felt that some of their lecturing staff would be able to integrate IT with their professional subject, with only 17% of respondents being positive about all their staff's ability to integrate IT with their professional subjects. Again the range of responses received on the integration of information technology with the professional subjects show that all the respondents do not have a clear understanding of what is meant by integration. This approach could be adopted by universities currently employing other departments to lecture the basic IT skills to their students.

(b) Tuition time allocated to IT trainingIT education

An analysis of the time allocated to the study of IT at all the South African universities with accredited accounting programmes revealed that, on average, 10% of total tuition time during the first three years of study was allocated to the study of IT (see figure 5.3). Most of this tuition time occurs in the first two years of study. Question 7 (appendix 3(c)appendix 3 section C) asked whether the respondent was of the opinion that 10% of total tuition time for the studying of IT subjects was adequate. Where they did not agree that the 10% tuition time was adequate, the respondents were asked to indicate a percentage they thought would be adequate. As was illustrated in table 5.3, the time spent on IT by the various universities ranges from 4% to 15% of total tuition time. This question therefore aimed to determine the respondents' perceptions on what they considered to be adequate tuition time. Sixty-seven per cent of the respondents indicated that the current average of 10% tuition time spent on IT trainingIT education was too little. Thirty-three per cent of the respondents indicated that 10% of total IT tuition time was adequate. Table 6.5 lists the total tuition time for IT as was proposed by the respondents.

Table 6.5: Percentage of total tuition time for IT as proposed by respondents

Total % tuition time for IT	Survey results
10%	**33%**
15%	**42%**
20%	**17%**
More than 20%	**8%**

The importance of spending enough time on IT trainingIT education is highlighted by the findings of this survey, with an average of 16% of total tuition time having been proposed by the respondents. Compared to the actual time currently spent on IT trainingIT education (between 4% and 15%) by the various universities, this survey indicates that all universities should spend more time on the IT trainingIT education of their students.

According to the survey analysis conducted and described in section 5.3.3, it was determined that only 33% of universities offer any courses with an IT component in the third year of study, with no university offering any courses with an IT component in the fourth year of study. Some of the IT skills listed in the IT skills framework can only be taught to students in their third or fourth year of study because the skills rely on the students' knowledge of professional subjects (for example audit software and taxation). Questions 8 and 9 (appendix 3(c)appendix 3 section C) asked the respondents whether they thought that there was scope in their current programme to introduce IT subjects or integrate IT with the current subjects in the third (question 8) or fourth year (question 9) of study. The results of the survey confirmed that 33% of universities already offered IT subjects (or integrated IT with the professional subjects) in the third year of their programmes. Of the 67% of universities that did not offer any third-year IT exposure to their students at the time, most of them (88%) were of the opinion that there was enough scope in the third year of study to introduce IT skills to their students. Forty-two per cent of all the respondents were of the opinion that there was enough scope during the fourth year of study to introduce IT competences by integrating IT trainingIT with the professional subjects.

The next part of the questionnaire obtained information about the existing IT infrastructure used by South African universities.

(c) IT infrastructure

IT skills can only be taught to students when they are required to perform tasks using a relevant hardware and software infrastructure. Question 101 (appendix 3(c)appendix 3 section C) determined whether universities had the necessary IT infrastructure in place to allow their students to acquire the IT skills. The result of the survey indicates that 92% of universities have the hardware and software already in place, with 8% of the respondents indicating that additional investment in hardware and software would be required to ensure that an adequate IT infrastructure is put in place.

If they are aware of the resources available to them, universities can develop strategies to implement the IT skills framework. Section Section DC of the questionnaire (appendix 3(c)appendix 3 section D) focused on identifying strategies that universities could employ in implementing the IT skills framework.

6.2.3.3 Questions relating to issues surrounding the implementation of the IT skills framework

Section Section DC (appendix 3) of the questionnaire focused on various issues that universities would face if they were required to implement the IT skills framework. Respondents were asked to assume that they had to implement the IT skills framework when answering these questions as if it was a prescribed by SAICA. This section of the questionnaire aimed to identify the steps universities think they would have to take to implement the framework, to identify the individuals who would be made responsible for the implementation, to determine what actions respondents deemed would be needed and to identify the impediments they consider that exist in their institution that could hamper the implementation of the framework.

(a) Changes required to the current way of teaching IT at universities

Question 11 (appendix 3(c)appendix 3 section D) listed a number of actions that could be performed by universities implementing the IT skills framework. Respondents were asked to select all the actions from this list that they would have to perform. The aim of this question was to determine the extent of actions required from universities they think will to enable them to implement the IT skills framework. The respondents were also given an opportunity to add additional actions that they thought would be required. The results of the survey are displayed in table 6.6.

Table 6.6: Changes necessary at universities

Introduce more IT-related subjects/modules in the accounting programme	67%
Provide additional training to existing lecturers in the four professional subjects to make them more technologically literate	58%
Redesign the accounting programme to allow more time for IT trainingIT education	42%
Provide additional training to existing IT lecturing staff to enable them to teach the IT skills	25%
Introduce IT subjects (or integrate IT concepts with the four professional subjects) in the 3rd year of the accounting programme	25%
Introduce IT subjects (or integrate IT concepts with the four professional subjects) in the 4th year of the accounting programme	25%
Acquire additional hardware and software	25%
Appoint suitably qualified IT lecturing staff	17%
Make Accountancy department responsible for IT trainingIT education	0%

The action that is required from according to most respondents is the expansion of the accounting programme to include more IT-related subjects (67%). This correlates with the findings from question 8 that showed that 67% of universities do not offer any IT course in the 3rd year of study. To expand the accounting programme would require the programme to be redesigned to allow for additional time to be spent on IT trainingIT education, as was indicated by 42% of respondents (table 6.6). Fifty-eight per cent of the respondents also said that additional training should be provided to their existing lecturers in the professional subjects to make them more technologically literate. This is in line with the findings of question 6 (see section 6.2.3.2(b)), which indicated that most respondents (75%) were of the opinion that only some of the lecturing staff had the ability to integrate IT with their subjects without any additional IT trainingIT education.

(b) Responsibility for implementing the IT skills framework

The IT skills framework lists the critical skills required of accountants students when they enter the profession. These skills are acquired through academic studies at universities as well as during on-the-job training conducted by auditing firms and business organisations. Question 12 (appendix 3(c)appendix 3 section D) aimed to

establish who the respondents thought should be responsible for implementing the IT skills framework to ensure that accountants students entering the accountancy profession are competent in using technology. The results of the survey indicated that all the respondents (100%) were of the opinion that the implementation of the IT skills framework should be developed in partnership between universities, auditing firms and business organisations. As most of the IT skills listed in table 4.2 require accountants to apply these skills in a professional work environment, it would be advantageous if universities and the training firms (responsible for the practical training of future trainee accountants) were to co-operate to determine which of these skills could best be acquired during the academic training education at the universities and which skills could best be acquired during the practical training at the training firms. Auditing firms and business organisations can also supply universities with practical cases that would reflect the existing business environment.

An expectation gap may exist between universities and training firms, resulting in some IT skills not being covered by either party. This could result in accountants students entering the profession without being fully competent in using technology. By setting up a partnership or working agreement between the universities and the main training firms in the area, both parties can be clear on what IT skills are taught to the students. It also will enable universities to draw on the practical experience of training firms in designing and integrating IT with the professional subjects using relevant accounting and business examples.

Where respondents indicated that universities were totally or partially responsible for implementing the IT skills framework, question 13 (appendix 3(c)appendix 3 section D) aimed to establish who within the institution would be made responsible for ensuring the successful implementation of the IT skills framework. The importance placed on the successful implementation of the IT skills framework within an institution could be determined by analysing the individual(s) responsible for the implementation. The results of question 13 are displayed in table 6.7.

Table 6.7: Responsibility for implementing the IT skills framework

Programme co-ordinator for accounting programme	33%
Various subject heads (auditing, financial accounting, etc.) where IT is integrated with the subject	33%
Head of the department/centre/school of accounting	25%
IT function/department/centre	25%
Lecturers involved in professional subject must take responsibility for integrating IT with their subject	17%
Individual lecturers responsible for IT trainingIT education	8%
Other: *An IT programme co-ordinatorcoordinator/mentor*	8%

The results as depicted in table 6.7 confirm the importance of the proper implementation of the IT skills framework, with responsibility being shared by the programme co-ordinator (33%),, various subject heads (33%) and heads of departments (25%). The majority of universities will control and plan for the implementation of the IT skills framework on a senior level (91%) and then make individual lecturers and other departments responsible for implementing their plans.

Question 14 (appendix 3(c)appendix 3 section D) identified a number of strategies for implementing the framework within an institution and asked respondents how they would go about implementing the framework. The results of the survey are displayed in table 6.8.

Table 6.8: Method of implementing IT skills framework

Accounting programme co-ordinator would facilitate implementing IT skills framework with other relevant lecturers	50%
Appoint a task team to investigate how best to implement an IT skills framework in the institution	33%
Head of department/centre/school would facilitate implementing IT skills framework with other relevant lecturers	17%
Wait for SAICA to give instructions on how to implement the framework	8%
Each lecturer should decide on how to implement the IT skills framework him/herself	0%
Implementation of the IT framework is the responsibility of another department (e.g. Information / /Computer Science)	0%

The survey revealed that the majority of respondents (83%) would either use the accounting programme co-ordinator to facilitate the implementation or appoint a task team to investigate how best to implement the framework. Only one respondent indicated that they would wait for SAICA to instruct them to implement the IT skills framework. None of the respondents indicated that they would devolve this duty to individual lecturers to decide themselves, nor devolve the responsibility to a department other than the accountancy department. This emphasises the importance respondents would attach to the proper introduction and management of IT skills training education to their students.

(c) Stumbling blocks in implementing the IT skills framework

Implementing the IT skills framework could be impeded within universities by a number of stumbling blocks that would have to be overcome. Question 15 (appendix 3(c)appen-dix 3 section D) listed a number of impediments and asked respondents to indicate which of them they think existed within his/her institution that would hinder the implementation of the IT skills framework. The impediments listed in question 15 revolved around the responsibility for IT trainingIT education within an institution, the ability of the lecturing staff, the availability of suitable study material, the pressure on achieving the outcomes of the SAICA syllabi and lack of motivation and/or resistance from the institution and/or staff. Some respondents also added additional stumbling

blocks, including lack of hardware and software and the view of students that IT was irrelevant to their studies. The results of this survey are displayed in table 6.9.

Table 6.9: Stumbling blocks to introduction of IT skills framework

Scope of SAICA syllabi makes it difficult to allocate more time to IT trainingIT education	83%
Resistance from lecturers to integration of IT with other professional subjects	58%
Lack of suitable lecturing staff with accountancy and IT knowledge in the market place	50%
Lack of suitable staff with IT knowledge in your institution	25%
Lack of capital/money to employ suitably qualified lecturers	25%
Lack of suitable lecturing material	25%
The view of lecturers that IT trainingIT education should be conducted during practical training at auditing firms	25%
IT component currently taught by department other than accountancy department that would make changes to the curriculum difficult to implement	25%
Other: *Lack of hardware and resources*	8%
Other: *View of students that IT is irrelevant*	8%

The two most important stumbling blocks identified by the respondents were the scope of the current SAICA syllabus, which makes it difficult to allocate more time to IT trainingIT education (83%), and a resistance from lecturers in the professional subjects to the integration of IT with their subject (60%). Fifty-six per cent of the respondents also felt that there were not enough lecturers available with accountancy and IT skills to successfully implement the IT skills framework. The other impediments that were identified by 25% of the respondents revolved around the lack of suitably qualified staff at the university, together with a lack of capital to employ suitably qualified staff, lack of relevant material, the view that it was the responsibility of the training firms, and that another department was responsible for the IT component, making it difficult to enforce a new framework.

Specific strategies should be developed by SAICA (as the professional body responsible for ensuring that their members stay up to date within the South African business environment) and the various universities to ensure that these stumbling

blocks are eliminated. These strategies will be identified and discussed in section 6.3.

6.2.4 *Summary of survey results*

The survey that was conducted resulted in all the universities with accredited accounting programmes submitting their questionnaires. These questionnaires were completed by senior staff members of the university who were responsible for the training education of professional accountants. The majority of respondents (11 of 12 respondents) agreed with the contents of the IT skills framework as was developed in this research. The IT skills framework could therefore be used as a goal of the IT learning outcomes required for accountants students entering the accounting profession in South Africa.

The analysis of the existing resources available to universities shows that the majority of universities (75%) were satisfied with the skills and background of their current staff employed to conduct IT trainingIT education (although 50% of the universities used non-accountants for the IT trainingIT education of their students). This IT trainingIT education would probably focus more on the acquiring of basic IT skills and not necessarily the integration of IT with the professional subjects. Only a small number of respondents (17%) were confident that all their staff would be able to integrate their professional subject with the IT skills, although most of the other respondents were of the opinion that at least some of their lecturers would be able to cope with this integration.

Although universities currently spend about 10% of total tuition time on IT-related subjects, the majority of respondents (75%) were of the opinion that this was too little. The result of this survey indicates that respondents felt that at least 16% of total tuition time should be spent on IT-related training. The bulk of this time should be spent on the integration of IT skills with the professional subjects. Nearly all the universities have the necessary IT infrastructure in place to accommodate the IT trainingIT education of their students, although additional investment in software (like accounting software) may be required.

The questions relating to the implementation of the IT skills framework resulted in respondents indicating that in order to reach this goal, they would have to redesign their accounting programme to allow more time for IT trainingIT education by introducing more IT-related subjects or additional time for integration with the existing subjects. They would also have to provide additional training to their lecturers in the professional subjects to make them more technologically literate. To ensure that the integration of IT with the professional subjects takes place with the aid of relevant accounting and business examples, all respondents agreed that universities should enter into working arrangements (partnerships) with accounting firms and other business organisations. The best way of managing this implementation was deemed to be the accounting programme co-ordinator facilitating and monitoring the implementation. Although respondents agreed on the importance of increasing the time spent on IT trainingIT education, a number of stumbling blocks were identified that need to be overcome to ensure the successful implementation of the IT skills framework. The stumbling blocks were identified as the extent of the current SAICA syllabi, which makes it difficult to allocate more time to IT trainingIT education, resistance from lecturers to the integration of IT with their professional subjects and a lack of suitable lecturing staff with accountancy and IT knowledge in the market place.

The current perspectives on IT education offered at South African universities became evident in some of the answers received from the respondents. From the varied responses that was received on certain questions and issues, it was evident that role-players are aware of the importance placed on students becoming competent in using IT, but that there was a general ignorance about what exactly is meant by the term ‘acquisition of IT skills’. Some respondents were clearly under the impression that IT skills refer to student being trained in the use of technology or to train them to be able to use a vast number of software packages. The questions that relate to the integration of IT with the professional subjects and the impediments that were identified by respondents, illustrate that most of them know the phrase ‘integration’ but do not understand what it all entails.

The next section will discuss how the findings of the survey can be used to devise strategies for implementing the IT skills framework at South African universities.

6.3 Strategies for implementing the IT skills framework in South Africa

According to Goodstein, *et al.* (1993:28), four basic approaches can be used to close gaps between an organisation's current and desired state, namely:

(i) Lengthen the time frame for accomplishing the objective. This approach is used when the current allocation of resources is appropriate but more time is needed to achieve the goal than was initially planned.

(ii) Reduce the size or scope of the objective. This approach is viable if the vision is appropriate but lesser or somewhat modified objectives are more achievable and less risky.

(iii) Reallocate resources to achieve goals. This approach is appropriate if these goals can be achieved by focusing on existing resources that have been spread too thin.

(iv) Obtain new resources. This approach is appropriate when new talent or capital is necessary to achieve the desired goals.

As the new international education standard (IES) came into effect on 1 January 2005, all professional accountancy bodies are obliged to ensure that their accountants entering the profession adhere to these standards. Therefore option (i), namely allowing more time to adopt the IT skills framework, will contravene this standard. Option (ii) mentioned by Goodstein, *et al.* (1993:28), namely to reduce the scope of the objective, would mean that the IT skills framework as developed in this research should be modified to reduce its scope. As was found in the survey, 92% of the respondents agreed with the statement that the IT skills as discussed in table 4.2 were critical for accountants entering the profession. Limiting and/or reducing the scope of the IT skills framework is therefore not an option to consider. Options (iii) and (iv) as defined by Goodstein, *et al.* (1993:28) require the reallocation of existing resources and obtaining of new resources. These options seem to be appropriate in identifying strategies for universities to follow to ensure that they deliver accountants students to the profession who are competent in using technology.

Before specific strategies are identified and discussed, the assumptions that will be used, as deduced from the survey (section 6.2), are discussed first.

6.3.1 *Assumptions*

From the results of the survey as discussed in section 6.2, a number of assumptions can be deduced that could be applied to define strategies that universities can employ to ensure that their students are competent in using technology. These assumptions will ensure that all strategies that are defined will be relevant to the universities and will also aim to focus on the resolution of the most important issues as identified through the survey. An assumption is defined as a "statement that is assumed to be true and from which a conclusion can be drawn" (Bluerider, 2004). The following assumptions are identified from this research and survey:

- The IT skills framework as described in table 4.2 is accepted as a statement of the learning outcomes of the IT skills that students should possess on entering the profession. As the majority of respondents (92%) agreed with this framework, this assumption can be taken as true. However, the IT skills framework was developed using currently available research and referring to the current environmental context. As the environment (and technology) changes, the IT skills framework should be allowed to adapt to stay relevant.
- At least 15% of total tuition time during the first three years of study at universities should be allocated to IT and IT related subjects (see section 6.2.3.2 (b)). This time includes the study of basic IT skills as well as the integration of IT skills with the professional subjects.
- The study of technology consists of *basic* (or introductory) IT skills, where the student acquires knowledge and basic user skills about IT in general and *applied* IT skills where the student is able to integrate his knowledge of IT with the study of the professional subjects.
- Universities have an appropriate IT infrastructure in place to ensure that the skills listed in table 4.2 can be achieved (see section 6.2.3.2 (c)).

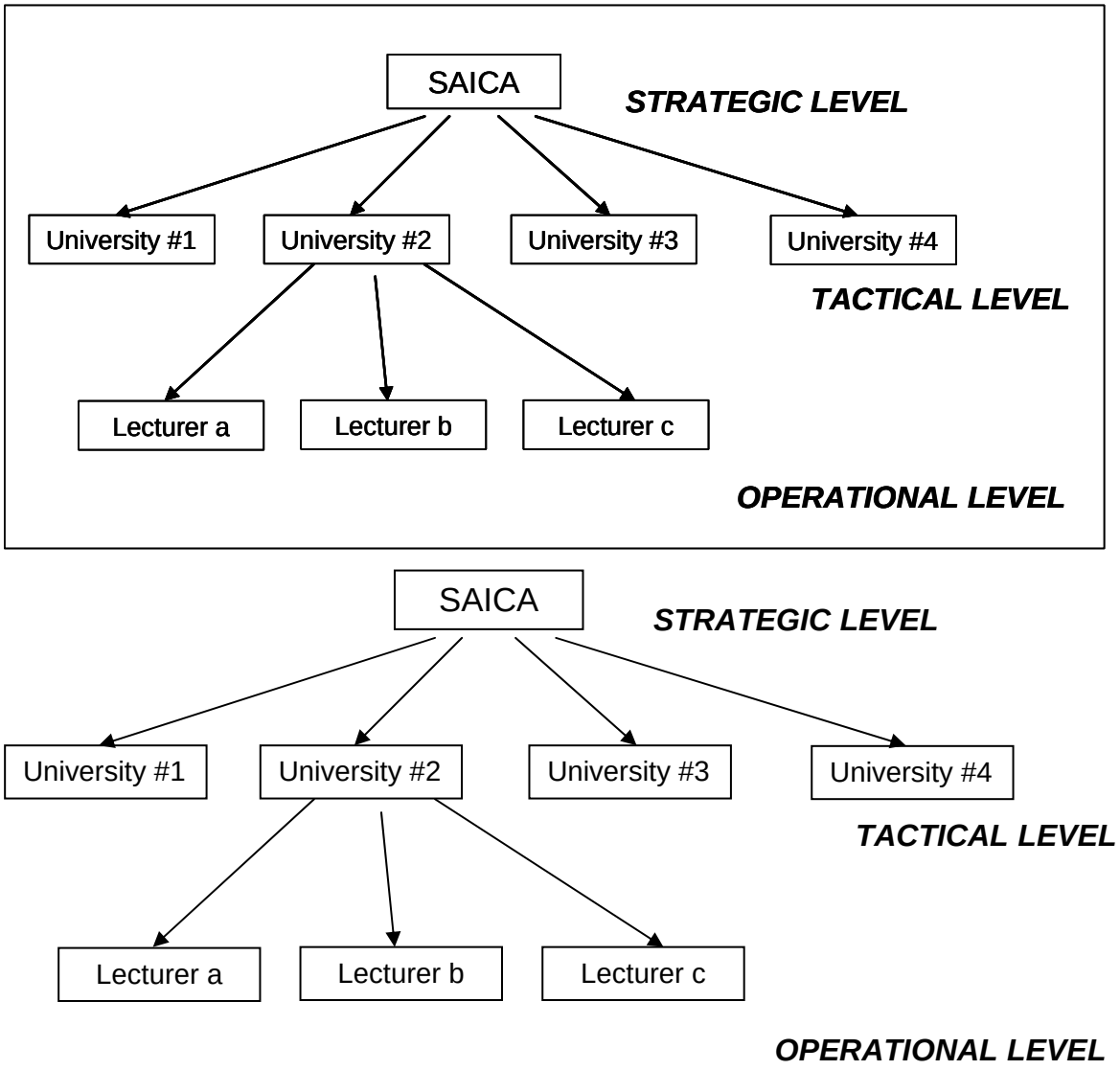
All the strategies that are discussed in the next section asection Are based on the assumptions as stated above.

6.3.2 *Strategic actions*

It was determined in section 6.3.1 that students are required to demonstrate the skills listed in table 4.2 in order for them to be competent in using technology. At least

15% of total tuition time needs to be allocated to the training education of IT and integration of IT with the professional subjects for them to acquire these skills. The various actions (and options) that are required to ensure that the strategic intent is achieved will be identified and discussed in this section. This discussion will include the responsibilities of the various stakeholders in implementing the IT skills framework. The roles of the stakeholders are illustrated in figure 6.1 according to their decision making responsibility:

Figure 6.1: Level of decision making of stakeholders



As the most important professional accountancy body in South Africa, SAICA is responsible for ensuring that all its members (and anybody else who want to join the profession) possess the knowledge and skills relevant for the environment in which they function. Universities offering tuition to the students who want to become professional accountants must ensure that their training education programmes include the relevant subjects and that they employ qualified lecturers to ensure that students acquire the knowledge and skills they need to be accepted by the professional accountancy body. Within each university, lecturers are appointed to teach the required syllabi curricula to the students to ensure that they acquire the

knowledge and skills as required by the university and SAICA. The strategies that are discussed in the remainder of this section will also focus on the role of the various stakeholders in implementing the strategies.

6.3.2.1 The redesign/realignment of the SAICA syllabus

SAICA decides on the knowledge and skills required of students who want to join the profession. The knowledge and skills requirements should be determined by ongoing research. SAICA provides the universities offering tuition to students with direction about the contents of their programmes by setting syllabi for the various subjects. The SAICA syllabus on Information Technology (SAICA, 2005c4:15385/053) sets out the content of IT trainingIT education (including the knowledge and skills requirements). To ensure that the newly qualified chartered accountant has the appropriate minimum level of knowledge and skills, the SAICA IT syllabus has been organised into:

- an IT-supportive course intended to equip all chartered accountants with:
  - essential general IT knowledge
  - knowledge of IT controls
  - competency in the use of commonly used IT application software;
- competency requirements in respect of IT control, which is expected to be a core competency of all newly qualified chartered accountants, regardless of their specific domain of professional activity; and
- competency requirements relevant to a chartered accountant's role as a manager and/or evaluator of IT and to the application of IT in an accounting/business context.

Competency is defined by SAICA as "the ability to perform specified tasks to achieve outcomes at the level required for a newly-qualified chartered accountant. The competency levels expected at the point of qualification are as follows:

- knowledge and understanding of the competency elements listed in the syllabus in respect of internal control and the manager/evaluator roles, as evidenced by the ability to describe or explain the significance of the issues related to the required competences in a relevant business setting; and

- application of the IT systems/tools listed in the syllabus to business/accounting problems.

The required competences are expected to be developed by reference to the four core syllabi, viz. external financial reporting; auditing, assurance services and corporate governance, managerial accounting and financial management; and taxation" (SAICA, 2005c4: 15584/053-85/03).

The current SAICA syllabus differentiates between basic IT trainingIT education (through an IT-supportive course) and the application of IT to business and accounting problems (integrating IT with the professional subjects) (SAICA, 2005c). The content of the IT-supportive syllabus is such that proper guidance is given to universities in identifying the basic IT knowledge required of accountants and is therefore useful to universities in designing their basic IT course(s). According to SAICA (2005c4: 15649/053) "the IT competences are developed and integrated through the application of foundation IT knowledge and skills in a business/accounting context with the four core syllabi (auditing, financial accounting, managerial accounting/financial management, and taxation). These IT competences are further developed and integrated through practical application within a specialist education and training programme."

The syllabus lists the various IT competences that should be applied to business and accounting problems with a note that describes a relevant accounting and business task as "to gather, organise, summarise, interpret data; evaluate and choose alternative courses of action; document observations and decisions; devise strategies and tactics; evaluate performance; plan, schedule and monitor activities; direct allocation of resources; and communicate with others" (SAICA, 2005c4:17371/053-72/03). However, the current syllabus that refers to the IT competences to be developed by reference to the four core syllabi does not indicate what these "tasks" are, except that they are to be developed with reference to all the relevant core syllabi (professional subjects).

For SAICA to be able to be more descriptive about the specific tasks that accountants should be able to perform, each of the various core syllabi should be

expanded to include reference to the integration of IT by identifying those areas of the syllabus that could be integrated with IT, together with specific tasks and tools that could be used. The outcomes of the IT skills framework that was developed in this research could be used to give lecturers of the professional subjects guidance on how to integrate IT with their subjects, as it identifies tasks and tools that could be performed by using IT.

The redesigning of the SAICA syllabi to give proper attention to the integration of IT with the professional subjects would assist universities in the redesigning of the programmes they offer to their students. Because IT has to be integrated with all four the professional subjects, it may be beneficial if SAICA sets up a task team to consider how these IT skills could best be implemented within the overall syllabi. The task team could consist of academics in the four professional subject areas, IT specialists and representatives of the training firms. This task team should not only aim to give universities and the training firms a clear indication of what IT skills are required by SAICA to be included in the training education of professional accountants, but also to give practical examples and guidance on how these skills could be integrated with reference to specific topics and areas of the syllabi identified for this integration.

6.3.2.2 Redesigning of syllabuscurricula/modules at universities

As was indicated by the response to the questionnaire (appendix 3), universities felt that one of the impediments to implementing the IT skills framework was the scope of the current SAICA syllabus, which makes it difficult to allocate more time to IT trainingIT education (section 6.2.3.3 (c)). It is therefore important that all the syllabi are revised by SAICA to integrate IT with the professional subjects and to identify specific areas, tasks and ways of integrating IT. Universities would then be able to redesign their programmes to allocate more time to the training education and integration of IT skills.

By using the revised SAICA syllabi, universities can decide how best to implement the IT skills framework. The basic IT skills (how to use the various IT tools) would probably best be taught through a supportive course offered in the first and/or second year of study. This course/module could be offered by an IT department,

accountancy department or computer science department, as long as the practical examples that are used refer to relevant accounting and/or business issues.

Some IT skills listed in table 4.2 (including all the skills listed as mastery and proficiency) can be acquired only through proper integration with the professional subjects. Because students are required to have a basic knowledge of the professional subjects before they can integrate them with IT, most of the integration should occur during the second, third and/or fourth year(s) of study. Universities can adopt various strategies to ensure that these IT skills are acquired by their students. The specific strategy chosen by a university will depend largely on the prevailing situation at that university. The strategies are discussed next.

(a) Integrating IT skills with existing professional subjects

Universities can require the lecturers responsible for the teaching of the professional subjects to be responsible for the integration of the relevant IT skills with their subjects. The overall programme as offered by the university remains the same, but the syllabi curricula of the professional subjects are redesigned to include appropriate assignments and tasks requiring students to use IT in solving problems related to the professional subjects. This integration can occur in all the years of study in which that professional subject is offered.

The advantages of using this strategy are that lecturers can ensure that students have acquired the theoretical knowledge on an aspect of the syllabus curriculum before students have to apply this knowledge with the aid of technology to solve a business and/or accounting-related problem. This approach not only ensures that students acquire an IT skill, but would also increase the students' comprehension of certain aspects of the professional subject. Students would also see the relevance and understand the importance of using technology, as these skills are taught using problems similar to those they encounter in the professional subjects.

One disadvantage of this strategy is the lecturers' of the professional subjects current lack of ability in and their resistance to the inclusion of IT trainingIT education in the current teaching of that subject. This may be resolved by training these lecturers in

the use of IT and by supplying them with relevant guidance and examples on how to integrate IT with their subjects.

Another disadvantage of this approach is that students may have to complete too many IT assignments at a given time (for example students are required to complete IT assignments in all four professional subjects at once), resulting in resistance from students due to a lack in co-ordination between the various lecturers in the professional subjects. Proper communication and consultation are required between all the lecturers involved in the training education of accountants to prevent this from happening.

The biggest most important disadvantage of this strategy is the entrenchment of students' perception that issues/problems involving a professional subject are solved in isolation. Typical business and or accounting problems relate to a range of issues involving more than one of the professional subjects. Assignments linked to one professional subject would result in students not acquiring the skill to solve problems across these disciplines. Information technology together with relevant business cases could be used effectively to demonstrate to students how to integrate their knowledge of all the professional subjects to solve a business problem.

(b) Introducing IT subjects in second and third year that integrate knowledge of professional subjects with IT

A second strategy that can be adopted by universities is to introduce dedicated IT subjects in the second and third (and/or fourth year) of study with the aim of integrating certain knowledge areas of the professional subjects to solve business and accounting problems with the aid of information technology. This strategy would require the redesigning of the accounting programme to allow sufficient time to introduce these subjects. Universities will also have to appoint or identify lecturers who have a good knowledge of IT and a basic knowledge of the professional subjects to teach these IT subjects.

Students can be presented with business problems (or assignments) that they should solve by using information technology together with their knowledge of the professional subjects. A business problem can result in students having to use their

knowledge of all the professional subjects at the same time. This will result in students not viewing the professional subjects in isolation, but becoming aware of the interaction and cross-referencing that are required to solve typical business and accounting problems. A dedicated lecturer responsible for the IT trainingIT education will also ensure that all the required IT skills are covered and that the assignments are spread evenly throughout the year/period.

A potential problem with this strategy is the scarcity of academic staff with IT skills and sufficient knowledge of the four professional subjects to act as the leaders for a dedicated IT subject. The lecturers in the professional subjects may also be unwilling and unhelpful in identifying areas for integration or assisting in the solving of technical problems relating to their field of expertise. Students may perceive this subject(s) as not important to them and could spend inadequate time on completing assignments. The successful implementation of this strategy depends on how the university is going to address the issues mentioned here.

(c) Other strategies

Universities can also adopt other strategies to enhance the strategy of integration they select (section 6.3.2.2(a) or section 6.3.2.2(b)). If a task team consisting of IT specialists (non-accountants) is appointed together with lecturers involved with the professional subjects, they can identify areas and ways of integrating IT with the professional subjects. This approach may result in the identification of suitable areas for integration, but the IT skills should still be taught either as part of the professional subjects (section 6.3.2.2(a)), or as a separate IT module(s) that integrates areas of the professional subjects with specific IT assignments (section 6.3.2.2(b)).

Universities can also outsource the responsibility of training educating their students in the IT skills by entering into working agreements with local auditing firms. This would result in students acquiring relevant IT skills offered by professional accountants in practice using real world (business/accounting) examples. This approach may also improve the perception students have of the importance of acquiring relevant IT skills.

Although both strategies discussed in sections 6.3.2.2(a) and 6.3.2.2(b) can be adopted by universities, outsourcing will probably be more successful in the first approach, where lecturers involved in the teaching of a professional subject can use the knowledge of a professional accountant (from the auditing firm) to demonstrate or conduct the integration of certain aspects of the topic with IT. However, it may be problematic to identify suitably qualified and dedicated professionals from the auditing firms to be involved with the teaching of a subject on an ongoing basis.

The strategy that will be adopted by a university will depend largely on the existing resources available to it and the way that the IT function is structured within the institution. For any strategy to be successful, the accountancy department/school/ /centre should be (or become) responsible for the integration of the IT skills with the professional subjects. Students and accountancy lecturers should also be made aware of the importance of acquiring these IT skills in order to be considered competent professional accountants.

6.3.2.3 Redesigning of material and approach to IT trainingIT education at universities

One of the key problems identified with the integration of IT skills with the professional subjects is the lack of suitable study material and examples available to lecturers. Even if SAICA were to decide from a strategic perspective that IT skills should be integrated with the professional subjects, lecturers will only be able to implement this strategy if they are trained and motivated to deal with this integration. The successful implementation of this integration strategy depends on the guidance offered by SAICA. The syllabus of the four professional subjects could be expanded to include reference to areas where integration with IT could occur. SAICA could appoint a task team that could develop guidance on how universities could integrate IT with the professional subjects. This guidance could identify areas of integration together with IT tools and tasks that students should be able to use.

The development of relevant business and accounting cases that could be used by lecturers and students to integrate their knowledge of professional subjects with IT

assignments is critical if universities are going to implement this strategy of integration successfully. Some business and accounting cases do exist and are used by auditing firms in training their article trainee accountantsclerks. Universities could enter into working agreements with these firms to enable them to use this material.

The strategy where lecturers involved in the teaching of professional subjects are required to refer to and use technology as part of their existing syllabus curriculum will be more difficult to manage and implement. However, the process may be enhanced by giving these lecturers the necessary tools (syllabus curriculum guidance, business cases, examples and study material). A concerted effort should also be made by SAICA to stress the importance of integrating IT skills with the professional subjects. When assessing the knowledge and skills of accountants students who want to enter the profession, SAICA should include a thorough assessment of the IT skills, with reference to the knowledge of the professional subjects.

6.3.2.4 Retraining of lecturers/appointment of new lecturers

According to the results of the survey as seen in table 6.9, 60% of the respondents felt that existing lecturers involved with the professional subjects would resist the integration of IT with the subject they are responsible for. Fifty-six per cent of the respondents also felt that there are not enough lecturers available with accounting and IT knowledge and skills to successfully implement the IT skills framework. In section 6.3.2.2 two strategies were identified that universities can employ to integrate IT with the professional subjects:

- integrate IT skills and trainingeducation with the syllabi curricula of the professional subjects and make these lecturers responsible for the integration of the IT skills; and
- develop separate IT modules in the 2nd and 3rd years (and/or 4th year) in which IT skills are integrated with relevant areas of the professional subjects by using business and accounting-related cases together with practical assignments.

The first strategy requires the lecturers of the professional subjects to be made responsible for the integration. Respondents indicated that they expect resistance

from these lecturers against this integration. Forcing all these lecturers to become more IT competent and to integrate IT with their existing syllabus may deepen their resentment against technology. This resentment could subconsciously be communicated to the students, resulting in similar resentment from the students against to using technology.

The second strategy requires universities to use or appoint accounting professionals with adequate IT skills and knowledge of the professional subjects to be responsible for the IT modules in the 2nd and 3rd years. However, 56% of the respondents indicated that these lecturers were not readily available in the market to make these appointments. One possible solution that can be adopted by universities is to identify existing staff members who have adequate knowledge of the professional subjects and who show an interest in technology. These individuals should be given proper training and resources to develop their IT skills in order to be responsible for the IT modules.

To ensure that the IT skills framework is implemented successfully, it is suggested that universities should identify individual accounting lecturers who show an interest in IT to retrain and redeploy them within the accounting department to focus on the training of IT skills, rather than force all accounting lecturers to be trained in and take responsibility for the teaching and integration of IT.

6.3.2.5 Addressing stumbling blocks

By following a structured approach to the implementation of the IT skills framework, most of the stumbling blocks identified in table 6.8 could be resolved.

If SAICA makes the strategic decision that IT skills are critical to professional accountants in South Africa, it could instruct the Education Committee to appoint a task team to analyse the current syllabus and identify areas within the syllabus where IT can be integrated with the professional subjects. It should also supply guidance to the universities on how they could go about implementing this new syllabus. It is therefore critical from a strategic decision making level that the importance of IT skills be recognised and included in the syllabus so that enough time can be spent by universities in ensuring that their students acquire these skills.

Resistance from lecturers to the integration of IT with the professional subjects could be reduced if the lecturers were given proper guidance, examples, business cases and material to be able to integrate IT with their subjects. If the lecturers are convinced that IT enables their students to better understand the principles of the professional subjects, they would also be more willing to experiment with ways of integrating IT with their subjects. Universities should also identify lecturers within their departments to act as champions of this integration process. If they can promote and demonstrate the value of IT skills to their accounting students, the resistance from the other lecturers may decrease.

Students view IT as irrelevant because the practical assignments they are required to complete do not reflect a relevant business or accounting context. If all IT assignments done by students reflected a business or accounting problem and lecturers stressed the important role that IT plays in the daily work performed by professional accountants, this negative perception of students should be eliminated. The view of students that IT is irrelevant to their future profession could also bey dispelled by using professional accountants to teach the IT component of the programme.

6.3.3 *Implementation of strategic actions*

All strategies that are identified to close the gap should be implemented within a specific time frame. Possible strategic actions that could be performed in South Africa are summarised in table 6.10.

Table 6.10: Strategic actions required to ensure that accountants entering the South African business environment are competent in using IT

Decision making level	Actions	Decision making body/person
Strategic (SAICA)	• Acknowledge the importance of IT skills for accountants	• Education Committee, SAICA

	• Integrate IT skills framework into syllabi of the professional subjects • Provide guidance on implementing the integration of IT into professional subjects	• Education Committee task team • Education Committee task team
Tactical (Individual universities)	• Redesigning of accountancy programme to include adequate IT trainingIT education • Deciding on strategy to ensure coverage of IT skills framework – Integrate IT with existing professional subjects; or – Introduce dedicated IT subjects in 2nd and 3rd years • Ensure adequate IT infrastructure exists • Ensure that staff are appointed, trained, motivated and equipped to focus on IT skills	• Head of accountancy departmendepartmen t t/ or programme co-ordinator • Programme co-ordinator • IT function • Head of accountancy department
Operational (individual lecturers)	• Develop the required material (business/accounting problems integrated with IT) • Encourage and motivate students to acquire the IT skills	• Accountancy lecturer(s) • Accountancy lecturer(s)

It is crucial to the successful implementation of the IT skills framework that all three levels of decision makers are dedicated to ensure that accountants students entering the profession in South Africa are competent in using technology (table 6.10).

The *strategic level* decision makers are responsible for planning the objectives of the organisation, and for assessing whether the objectives are being met in practice (BPP Study Text, 2004:521). SAICA, as the premier professional accountancy body in South Africa, is responsible for the strategic planning for the profession. In this

research it was determined that accountants students entering the profession in South Africa should posses certain IT skills. As part of setting objectives for the profession, SAICA has decided that one of the objectives is to ensure that accountants in South Africa are competent in using technology. To ensure that this objective is achieved, SAICA sets syllabi that all universities with accredited programmes are expected to adhere to. The syllabi determine what universities are expected to do to ensure that the objective of delivering competent accountants to the profession is reached.

SAICA could therefore ensure that the objective of competent accountants is being met by prescribing what accountants should know about IT and how they should be able to apply their IT skills. The Education Committee revises syllabi regularly. The importance of acquiring these IT skills and integrating them with the professional subjects has already been addressed in these syllabi. However, the syllabi should be expanded to give guidance in identifying areas of the professional subjects that can/should be integrated with IT. SAICA is also responsible for assessing whether these objectives are being met. This is done by assessing candidates' knowledge and skills when they write the Qualifying Examination, and when SAICA evaluates the programmes of universities in regular accreditation reviews.

Individual universities are responsible for implementing the strategic plans (in the form of SAICA's syllabi) and need to decide on how to use the resources of their organisation, and to monitor how these resources are employed. This is known as *tactical decision making* (BPP Study Text, 2004:521). Each university has to decide on how to implement the syllabi as prescribed by SAICA. This would include what subjects are being taught, the time allocated to each subject, who are responsible for teaching the subject, and how these outcomes are assessed. To ensure that a university complies with the SAICA syllabi on IT skills, it needs to decide on an accountancy programme that includes adequate exposure to IT skills, to ascertain that students are able to integrate their professional knowledge with their IT skills, that an appropriate IT infrastructure exists within the institution that would support the student in acquiring all the necessary IT skills, and to assess whether students completing the accountancy programme possess the required IT skills.

Individual lecturers at universities are responsible for teaching and assessing the specific knowledge and skills of their accounting students. They need to ensure that students are able to demonstrate that they possess the required knowledge and skills when they have successfully completed a specific module/subject. This is known as *operational decision making* (BPP Study Text, 2004:521). Lecturers who are responsible for teaching the IT component of the programme, or who need to integrate IT with their professional subjects, should ensure that they are trained, motivated and equipped to teach these IT skills. They should also be able to develop or have access to the required material that aims to integrate IT with business and accounting problems and cases, and that their students are encouraged and motivated to focus on the acquisition of IT skills.

To ensure that accountants students entering the profession in South Africa are competent in using technology, it is vital that all three levels of decision makers work together to ensure that this objective is met.

6.4 Conclusion

In this chapter, the perceptions of important role-players at universities with accredited accounting programmes were identified and discussed. This resulted in the identification and discussion of a number of strategies that universities can employ to ensure that they meet the objective of delivering students who are competent in using information technology to the training firms.

The important role that professional accountancy bodies (for example SAICA) play in setting and assessing strategic goals for the education of their future members was also discussed in this chapter. These professional accountancy bodies should prescribe syllabi that demonstrate the importance of possessing relevant IT skills to accountants. They should also give guidance on how these IT skills could be taught to students, and assess whether these goals are being met. This would encourage the universities to redesign their accounting programmes and change their approach to the teaching of IT skills to ensure that these objectives are achieved.

From the survey that was conducted it was clear that the role-players at the various universities agree about the importance of their students acquiring a relevant set of IT skills and that enough time should be set aside in the accounting programmes to ensure that students acquire these IT skills. They also agree that working arrangements should be entered into with training firms to ensure that proper business and accounting cases are used in integrating the professional knowledge required from students with their IT knowledge.

Most of the stumbling blocks identified could be overcome if the inclusion of IT trainingIT education for students is properly planned for. From the strategic level at SAICA, down to departments of accountancy at universities and the individual lecturers, each one plays an important role in ensuring the successful implementation of a strategy that will enable accountants students who enter the profession in South African to be competent in using technology.

Chapter 7
Conclusion and recommendations

7.1 Introduction

The accountancy and auditing profession operates within an environment that is changing at a rapid pace. It is the responsibility of the profession to ensure that all its members (including future members) meet the expectations that the users of their services have of them. Professional accountants need to stay remain relevant in this changing environment that may require them to change or adapt the services they offer to their clients. It is the responsibility of professional accountancy bodies (like SAICA) to strategically plan for these changes to ensure that members who join the profession possess the required knowledge and skills to be relevant and to stay remain relevant within the environment in which they operate.

One of the key drivers of change in the environment has been identified as the advances in information and communication technologies. Information and communication technologies have an impact on the role that accountants play in the environment (i.e. what they do), as well as on how they perform this role (i.e. how they do it). The main aim of this research was to develop a framework that sets out the IT competencies required of students who enter the accounting profession as trainee accountants in South Africa and to evaluate the current education these students receive at South African universities. The main aim of this research was to determine if, and to what extent, students who have completed their formal education and enter the profession as trainee accountants possess the knowledge and skills to enable them to interact with and use information technology in such a way that they can be regarded as competent accountants within the South African business environment. Accountants are educated in South Africa through formal studies completed at universities that offer programmes that are accredited with a professional accountancy body (for example SAICA), as well as through practical training offered by training organisations. During this education process, accountants students acquire the knowledge and skills prescribed by the professional accountancy body, so that they can join the profession as competent accountants.

The first part of this chapter consists of a summary and conclusion of the research problem as was defined in chapter 1. This will be followed by a number of recommendations stemming from this research as well as the identification of areas for future research.

7.2 Summary and conclusion

The research problem that was investigated was to determine whether, and if so, to what extent, students who enter the profession as trainee accountants are competent in using information technology within the current South African business environment. determine if, and to what extent, accountants who enter the profession as trainee accountants are competent in using information technology within the current South African business environment. The approach that was followed in addressing the research problem was to identify and analyse the constituents that contribute to or influence the formal education of accountants in South Africa. The constituents were identified as:

- professional accountancy bodies that prescribe the IT knowledge and skills required from their future members;
- the business environment in which accountants are required to apply their IT skills; and
- South African universities that are responsible for the formal education of students and provide their students with IT knowledge and skills.

The results of this analysis are summarised below.

7.2.1 Professional accountancy bodies

Professional accountancy bodies prescribe the knowledge and skills they expect their future members to possess. IFAC (International Federation of Accountants), as the umbrella body for the accountancy profession in the world, has issued a set of education standards that describe the knowledge and skills required from all professional accountants. In these education standards specific reference is made to the information technology knowledge and skills that are required from students, with more syllabus guidance provided in the form of a guideline (*IEG 11*) (IFAC Education Committee, 2003a). SAICA, as the premier professional accountancy body in South Africa, has adopted these standards and incorporated guideline *IEG 11* in the IT

syllabus prescribed to students who intend joining the profession in South Africa (SAICA, 2005c).

The current IT syllabus as prescribed by SAICA is prescriptive with regard to the IT knowledge required of accountants, but is brief and very vague on the specific IT skills that accountants need. The reference made in the IT syllabus to specific IT skills, as illustrated in table 7.1, is cryptic and provides no guidance to educators about the depth of skills that is required, or the specific elements/actions that a student should be able to perform to acquire that skill.

Table 7.1: Extract from the SAICA's IT syllabus regarding IT (SAICA, 2004:105/03)

Units	Elements
Use IT systems/tools relevant to business/accounting	Use operating system (Windows, other)
	Use word processing software
	Use spreadsheet software
	Use database software
	Use internet tools (e-mail, web browser, FTP, other) software
	Use professional research tools
	Use business presentation software
	Use anti-virus and other security software
	Use utility software and other relevant software
Apply controls to personal system	Ensure processing integrity of IT resources
	Ensure security and safeguarding of IT resources
	Ensure availability/continuity provisions (back-up and recovery) for IT resources

Source: SAICA (2005c:173/05)

In this research study the IT skills required of professional accountants were elaborated on by analysing research that was conducted by other professional accountancy bodies and academic researchers to identify compile a more complete and detailed list of IT skills (table 2.43). The IT skills were divided into three categories that, according to the research, depict the specific competences an accountant requires to perform his/her job. The categories of skills identified were:

- the accountant as a user of technology in performing daily business and office tasks;
- the accountant conducting assurance testing using technology or evaluating technology (audit automation skills); and
- the accountant interacting with new and emerging technology as a manager, user and designer of this technology.

The table of IT skills (table 2.43) that was developed in this research lists all the required capabilities and provides an explanation of what an accountant is expected to do in each of the skills. However, this IT skills list (table 2.43) does not describe the skills and capabilities in sufficient detail or depth to give educators clear guidance on how to apply them in practice.

The IT skills list as identified in table 2.43 stipulates that all the IT skills should be acquired within a relevant business and/or accounting context. To be able to supply more guidance on how each IT skill could be applied within a relevant business and/or accounting context, it was important to investigate and determine the needs of the environment in which accountants operate. The South African business environment was therefore analysed to determine the role accountants play in this environment and the information technology tools used by South African business organisations.

7.2.2 South African business environment

To understand the South African business environment that accountants interact with, the research analysed the accountancy profession in South Africa, the general business environment and the information technology used by South African organisations.

The accountancy profession in South Africa was analysed to determine the role accountants play in the business environment (i.e. what accountants do). In the research it was determined that 93% of professional accountants are members of SAICA (South African Institute of Chartered Accountants), with 48% of these members employed in the private sector and 25% working in public practice. It was

therefore important to ensure that the IT skills framework required of accountants incorporates the needs of accountants working in the private sector as well as in public practice.

The general South African business environment was analysed to determine the typical business forms that accountants will encounter, as well as the use of information technology within these business forms. From the research it was concluded that the majority of business forms in South Africa (99,9%) were private companies and close corporations. This spread of business forms is indicative of emerging economies and differs from the business environment one would expect to encounter in first world economies. The typical South African organisation spends on average 1% of its annual turnover on IT products, with the emphasis on basic information technology components (like personal computers and peripheral devices). New and emerging technologies do not currently play an important role in the current South African business environment. The IT skills (table 2.43) relating to new and emerging technologies are therefore not as critical to accountants to possess in the current South African business environment as the basic and user IT skills are.

The research also investigated the IT applications (software) used by typical South African organisations. The aim was to identify those IT tools that are important within the South African environment and that accountants should be able to use to function effectively within this environment. In this research it was determined that the majority of South African organisations use the Microsoft range of products (operating systems, office suite, web browsers and e-mail) for the general automation of the office environment. Pastel is used as the dominant software package for recording and reporting on the financial transactions of the organisation.

From this research it was evident that the South African business environment makes places specific demands on the information technology skills required of accountants. When students enter the profession as trainee accountants the emphasis should be on ensuring that students have mastered the basic IT skills necessary to function within a typical South African organisation rather than on attempting to deliver students who are experts on all the various aspects of information technology. The

aim of imparting IT skills during the formal education should be to enable the students to use basic information technology effectively to support the work function they perform at trainee accountant level. Students can decide during and after completing their practical training to specialise in other areas of information technology (for example in enterprise resource planning systems, electronic commerce, wireless communications, etc.).

The general IT skills framework (table 2.43) was then adapted to fit into the current South African business environment by:

- deciding on the *competence level* required for each IT skill (where IT skills that were deemed not critical to the current business environment were given a competence level of *awareness*, and those IT skills deemed more appropriate were classified as *ability* or *mastery* level of competence);
- deciding on the most appropriate *IT tool* that could be used by educators to ensure that an IT skill has been acquired by students (these IT tools reflect the typical IT tools used by business organisations in the South African business environment);
- deciding on *what* actions students should be able to perform to acquire an IT skill (by deciding on the capability, knowledge and understanding required for students to acquire a specific IT skill); and
- supplying practical *examples* of typical business cases that can be used by educators to ensure that an IT skill is acquired using a relevant business and/or accounting context. This was done by illustrating how the contents of the other professional subjects (financial reporting, managerial accounting and financial management, taxation and auditing) could be integrated with specific IT skills.

The result of this analysis led to the compilation of a detailed and comprehensive list of IT skills that are deemed to be critical for students to possess on entering the profession as trainee accountants (see table 4.2) in South Africa. This framework of IT skills would give the educators of accountancy studentsaccounting students clearer guidance on how to ensure that their students are competent in using information technology.

7.2.3 South African universities

The main aim of this research was to develop a framework that sets out the IT competencies required of students who enter the accounting profession as trainee accountants in South Africa and to evaluate the current education these students receive at South African universities.The purpose of this research was to determine if, and to what extent, students who currently enter the profession as trainee accountants are competent in using information technology. The list of IT skills, as developed in the first part of the research (table 4.2), was used as the benchmark of the IT skills trainee accountants are expected to possess. The second part of the research focused on whether, and to what extent, students currently that have completed their formal educationqualifying as trainee accountants in South Africa possess the critical IT skills as identified in table 4.2.

A position audit was conducted to investigate the current position regarding the teaching of IT skills at South African universities. In this audit it was determined that 50% of universities use lecturers who are professional accountants to teach students IT skills, with the other universities employing other professionals (for example scientists, programmers and business academics) to teach these subjects. At those universities currently using non-accountants to teach students IT skills, the requirement that IT skills should be taught using a relevant business and/or accounting context may not be met. All the universities surveyed allow their students to use computer facilities that were set up in a networked environment. Students gain a number of critical IT skills in using these facilities, although lecturers should explain to students the management and security issues involved in these skills and how they apply to business organisations.

On average, universities allocate 10% of the total tuition time during the first three years of study to IT-related topics. This compares favourably with the time allocated to some of the other professional subjects (for example Managerial Accounting and Financial Management, Auditing and Taxation). However, most (or all) of the time allocated to IT trainingIT education occurs during the first two years of study. This may limit the ability of students to gain the required competence level of IT skills in some areas in that most of the professional subjects are introduced only in the second (or third) year of study. Students need to master the theory of these subjects

before they can apply them by using IT as a tool to solve business and accounting problems. The 10% of time allocated to IT trainingIT education includes the coverage of the knowledge component of the IT syllabus, as well as the practical assignments (covering the IT skills). Most universities allocate less than 50% of their IT courses to practical assignments, with most of the emphasis being placed on acquiring IT skills in the basic use of the Microsoft Office Suite (Word, Excel, Powerpoint) and accounting packages (e.g. Pastel). Other related IT skills (in the professional accountancy subjectsauditing, managerial accountancy and financial management and taxation) are not covered by a significant number of universities, nor is their any evidence of universities currently integrating IT skills with the professional subjects.

In analysing the current position in South Africa regarding the IT trainingIT education of
students at universities, the strengths of the IT trainingIT education were summarised as:

- sufficient time is allocated to IT trainingIT education during the first three years of study (10%);
- the universities all employ a networked information technology infrastructure, allowing students to get obtain exposure to working in a networked environment;
- students get are exposedure to the basic use of accounting packages;
- students get are exposedure to the basic use of the Microsoft Office Suite.

The weaknesses in the current position in South Africa regarding the IT trainingIT education of students at universities are:

- students are generally not exposed to IT skills in their third and fourth years of study at universities;
- IT is not sufficiently integrated with the other professional subjects;
- some universities use lecturers who are not professional accountants for the IT trainingIT education of their students, which results in students not obtaining the required level of competence because a relevant business and accounting context is lacking; and

- a number of critical IT skills are not covered by South African universities (relating to auditing skills, database search and retrieval, electronic working papers and tax return software).

7.2.4 Findings on relating to the research problem

The main aim of this research was to develop a framework that sets out the IT competencies required of students who enter the accounting profession as trainee accountants in South Africa and to evaluate the current education these students receive at South African universities.The main aim of this research was to investigate whether, and to what extent, students who enter the profession in South Africa as trainee accountants possess the skills to be regarded as competent in information technology within the current South African business environment. This research shows that serious shortcomings exist in the education of students, which result in students not being competent in using information technology within the South African business environment. The reasons for students not being competent in information technology includecould be attributed to:

- the lack of clear guidance on the IT skills required from students completing their formal education because of professional accountancy bodies (like SAICA) setting IT syllabi that are too vague and/or concise;
- ignorance regarding the IT skills that are required of trainee accountants to be competent in the South African business environment; and
- the lack of proper IT trainingIT education offered by South African universities that deliver students trainee accountants who possess a limited range of IT skills that may not be relevant to the environment in which students they will function to the training firms.

This research also determined and evaluated the perceptions of role-players at universities of the importance of a more detailed IT skills framework (as in table 4.2), as well as of the implementation of such a framework at the universities. The majority of role-players (11 of 12 respondents) agreed with the contents of the IT skills framework as was developed in this research, and it was concluded that the IT skills framework could be used as a benchmark for the **IT learning outcomes** required for students entering the profession as trainee accountants in South Africa.

Although universities currently spend about 10% of total tuition time on IT-related subjects, the majority of respondents (75%) were of the opinion that this was too little. The result of this survey indicated that respondents suggested that at least 16% of total tuition time should be spent on IT-related trainingeducation. The bulk of this time should be spent on the integration of IT skills with the professional subjects.

The questions relating to the implementation of the IT skills framework resulted in respondents indicating that in order to reach this goal, they would have to redesign their accounting programmes to allow more time for IT trainingIT education by introducing more IT-related subjects or time for integration with the existing subjects, as well as by providing additional training to their lecturers in the professional subjects to make them more technologically literate.

To ensure that the integration of IT with the professional subjects takes place using relevant accounting and business examples, all respondents agreed that universities should enter into working arrangements (partnerships) with accounting firms and other business organisations. The best way of managing this implementation was seen to be through the accounting programme co-ordinator facilitating and monitoring the implementation. Although respondents agreed on the importance of increasing the time spent on IT trainingIT education, a number of stumbling blocks were identified that need to be overcome to ensure the successful implementation of the IT skills framework. The stumbling blocks that were identified were the extent of the current SAICA syllabi making it difficult to allocate more time to IT skills trainingeducation, resistance from lecturers to the integration of IT with their professional subjects and a lack of suitable lecturing staff with accountancy and IT knowledge in the market place.

The important role that professional accountancy bodies play in setting and assessing strategic goals for the education of their future members was identified as one of the main strategies that could be employed. Professional accountancy bodies should prescribe syllabi that demonstrate the importance of possessing relevant IT skills to students. They should also give clear guidance on how these IT skills could be taught to students, and assess whether these goals are met. This would

encourage universities to redesign their accountancy programmes and change their approach to the teaching of IT skills to ensure that these objectives are met.

Through the survey that was conducted, it was clear that the role-players at the various universities agree on the importance of their students acquiring a relevant set of IT skills and that enough time should be set aside in the accounting programmes to ensure that students acquire these IT skills. They also agree that working arrangements should be concluded with training firms to ensure that proper business and accounting cases are used in integrating the professional knowledge required from students with their IT skills.

7.3 Recommendations

This research found that serious shortcomings exist in the range of IT skills that students currently acquire when studying at South African universities. The importance to the accountancy profession of students acquiring relevant IT skills has been highlighted throughout this research. To ensure that students entering the accountancy profession are regarded as competent in using technology, a number of strategies will be discussed in this section.the following strategies are recommended.

For any strategy to be implemented successfully, it is regarded as vital that all the role-players involved in the education of students should understand and accept the effect that information technology has on the work that accountants perform within the South African environment. The role-players that were identified are: professional accountancy bodies (SAICA as the premier professional body); universities offering accredited accounting programmes; individual lecturers responsible for IT trainingIT education; and individual lecturers responsible for professional subjects; training firms; and students. In the next section recommendations to address the problems identified in this research, will be discussed.The responsibilities of some of these role-players are discussed below.

7.3.1 South African Institute of Chartered Accountants (SAICA)

SAICA, as the premier professional accountancy body in South Africa, should take the lead in ensuring that all accountants students who have completed their formal education possess the IT skills that were identified in table 4.2. This would require

SAICA to acknowledge the importance of the acquisition of these IT skills to the work that accountants perform in South Africa. It is recommended that SAICA appoint a task team to investigate how these IT skills, which that were identified in table 4.2, could be integrated with the SAICA syllabi. This task team could consist of senior academics and practitioners, including specialists from the IT side, as well as individuals specialising in the professional subjects. This task team should be instructed to analyse the overall SAICA syllabi and set of IT skills (table 4.2) to identify specific areas of the professional subjects that could be integrated with the IT skills. A revised syllabus could be compiled that contains specific reference and guidance to how IT skills in specific areas of the professional subjects could be acquired.

This task team can also be instructed to supply detailed guidance to universities on how to integrate IT with the professional subjects by identifying all the knowledge areas of the professional subjects that should be integrated with IT, the specific IT skills that students should acquire (namely the actions the student should be expected to do), the depth of competence required at university level, the IT tools that the student could use, together with examples of practical business cases to demonstrate how these skills could be integrated. This guidance from SAICA is seen as vital to ensure that individual departments, lecturers and students understand the relevance and importance of acquiring a specific IT skill and that they understand how to ensure that this skill is acquired. Detailed guidance from SAICA would ensure that resistance to this integration from lecturers and students is minimised.

The importance of acquiring IT skills could be further enhanced if SAICA and PAAB properly evaluates the IT skills of students as part of its overall assessment of the knowledge and competence of students who have completed their formal education.

7.3.2 Universities with accredited accounting programmes

All the universities that offer accounting programmes that are accredited with SAICA are required by SAICA to cover the syllabi as prescribed. Individual universities can decide on how best to implement the SAICA syllabi, taking into consideration the

environment in which they operate. This could include the range of subjects taught to students, the tuition time allocated to each subject, the year of study in which subjects are taught and the length of the course. Accountancy departments would also decide on the subjects that would be lectured in-house and appoint lecturers who are capable of doing this, or outsource this function to other departments within the university that are more appropriate. For universities to comply with the IT skills framework they need to design an accountancy programme that includes adequate exposure to these skills and to ensure that their students can integrate their professional knowledge with the IT skills.

To reach the objectives set in the IT skills framework, it is recommended that:

- universities differentiate between supportive IT subjects and integrated IT subjects/concepts;
- the supportive IT subject be offered in the first (or second) year of study and be taught by lecturers who are accountants or IT specialists; if non-accountants are responsible for teaching the IT subject, universities should ensure that relevant business and/or accounting examples are used for practical assignments to be completed by the students;
- the integrated IT subjects/concepts be offered in the second and third (and/or fourth) years of study; universities can offer this be electing to follow one of two approaches:
    - Universities can make the lecturers who are responsible for the teaching of the professional subjects responsible for the integration of relevant IT skills with their subjects. The overall programme as offered by the university remains the same, but the syllabi curricula of the professional subjects are redesigned to include appropriate assignments, and tasks and assessments requiring students to use IT in solving problems related to the professional subject; or
    - Introduce dedicated IT subjects in the second and third (and/or fourth year) years of study with the aim of integrating certain knowledge areas of the professional subjects in solving business and accounting problems using information technology as the tool. This strategy would require the redesigning of the accounting programme to allow sufficient time to introduce these IT subjects. Universities will also have to appoint or

identify individual lecturer(s) that has a good sound knowledge of IT and a basic knowledge of the professional subjects to teach these IT subjects;

- universities and departments ensure that lecturers have the required resources available to ensure a successful integration. These resources include support from the senior management of the department in ensuring the success of this integration, access to IT trainingIT training, an adequate IT infrastructure available to students, and support from lecturers in the professional subjects to supply technical assistance on subject-related matters.

7.3.3 Individual lecturers

Individual lecturers are responsible for teaching and assessing the specific knowledge and skills of their students. Lecturers who are given the responsibility for either teaching the dedicated IT subjects or integrating IT skills with their professional subjects should ensure that they are equipped to deal with this responsibility. This may include attending IT trainingIT education courses, interacting with IT specialists and interacting with training firms. They should also ensure that the material they use, and practical assignments they give and assessments they conduct to students refer to relevant business and accounting cases. In interacting with their students, lecturers should demonstrate (through examples and through their own attitude to IT) the importance of the acquisition of IT skills to their students.

For the successful implementation of the recommended strategies it is important that all the role-players understand and demonstrate the urgency to integrate IT skills with the knowledge acquired in the professional subjects to ensure that students who enter the accountancy profession in South Africa are competent in using information technology.

7.4 Future research areas

The main aim of this research was to develop a framework that sets out the IT competencies required of students who enter the accounting profession as trainee accountants in South Africa and to evaluate the current education these students receive at South African universities.The main focus of this research was to determine whether, and to what extent, students who enter the profession in South Africa as trainee accountants possess the skills to be regarded as competent in information technology within the current South African business environment. A number of areas have been identified that could be the subject of further research.

This study did not attempt to determine the IT skills currently used by accountants in the South African environment, but rather identified IT skills accountants should possess to be effective within the South African environment. The reason for this was to allow a pro-active approach to ensure that accountants are trained who know how to use technology in all aspects of their work role, rather than have to take a narrow view that focuses only on the existing use of IT by accountants. Research could be conducted to determine the information technology currently used by accountants in the profession and comparinge this with the list of skills as determined in this research to identify gaps and recommend strategies.

In this research the focus was on the IT skills required of accountants. As was seen in chapter 2, professional accountancy bodies require their accountants to possess a number of other skills (for example communication skills, management skills, problem-solving skills, critical thinking skills). These skills are not acquired in isolation. Similar research could be conducted to determine what other skills are required of accountants in South Africa and then strategies can be identified to ensure that accountants acquire those skills.

The current business and IT environment was analysed using existing analysis and surveys and studies performed by reputable research companies. More precise research could be conducted by identifying the current business and IT environment as experienced by accountants in the South African environment. This would

necessitate a survey (through questionnaires) involving all professional accountants as the population to be studied.

A research project that investigates the effect, application, advantages and disadvantages of implementing the two strategies available to universities (namely integrating IT with existing professional subjects or introducing dedicated IT subjects), as suggested in chapter 6, could be conducted. This study could identify which of these strategies would be more effective under various scenarios.

7.5 Final remarks

The results of this research should be used by the important role-players in the South African accountancy profession to ensure that the profession stays remains relevant and keeps adding value to the services it delivers to an expanding range of clients. The pace at which the environment (and technology) is changing is not going to slow down; in fact it will most likely accelerate in the future, resulting in pressure being applied to all those involved in the profession to be able to justify the services they deliver.

Technology threatens to replace a number of functions previously performed by accountants (like the recording of transactions, compiling of financial reports, extracting of management reports). Accountants should be competent in using technology to enhance the services (and range of services) they offer clients.

Increasing pressure is being placed on the auditing profession to ensure that audited financial statements that are published fairly present a true and fair reflection of the organisation they investigated. With an increasing number of the transactions being recorded and processed electronically (sometimes using complicated technology networks and infrastructures), auditors should be competent in understanding and using technology to be able to conduct a proper audit on of these organisations. If not, the accountancy profession may experience more damaging publicity (like the Enron scandal), which could result in irreparable damage to the profession and to the value of accountants in general.

This research shows that there is a real sense within SAICA and academic circles of the importance of students acquiring a relevant set of IT skills through the integration of IT with the professional subjects. However, there is uncertainty about what these IT skills are and how it could be integrated with the professional subjects. It is therefore important that all the role-players understand and demonstrate the urgency to integrate IT skills with the knowledge acquired in the professional subjects to ensure that accounting students acquire the relevant and critical IT skills to be competent accountants within the South African business environment. This research provides a set of IT skills that, if students acquire it during their formal education at South African universities, would ensure that they enter the profession as competent trainee accountants.

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Appendix 1

QUESTIONNAIRE CHECKLIST ABOUT THE IT SKILLS OF ENTRY-LEVEL ACCOUNTANTS

To be used for the documentation analysis of published information available from all the universities with accredited programmes

NAME OF THE UNIVERSITY:	

A. General information about the university

1. Who is responsible for teaching the IT component to accounting students?

Department/school/ centre of accountancy	Department of computer science	Department of Information	Other

2. In what faculty does the department reside that is responsible for the IT training?

3. Does the university have adequate computer facilities that are accessible to its accounting students?

YES	NO

B. Information about the IT infrastructure available to the accounting students

4. The following statements relate to the general IT environment and infrastructure that are available and used by the accounting students.

4.1	The computers are connected via a local area network	Yes	No	Do not know
4.2	Students gain access to the network through using physical access controls (e.g. student cards)	Yes	No	Do not know
4.3	Students gain access to the network by entering a valid login name and password	Yes	No	Do not know
4.4	Students are supplied with a university e-mail address	Yes	No	Do not know
4.5	Students are allowed to save information on a server	Yes	No	Do not know
4.6	Students have access to a local intranet that contains information about programmes and course material	Yes	No	Do not know
4.7	Students are able to perform transactions on the intranet (e.g. on-line registration, electronic payment)	Yes	No	Do not know
4.8	Students have access to the Internet	Yes	No	Do not know
4.9	The university use a firewall to protect the network from outside users	Yes	No	Do not know
4.10	Students have to pay for using the Internet	Yes	No	Do not know

C. Courses and modules containing practical IT assignments.

5. List all the dedicated IT courses/modules that accountants would have to complete during their studies. For each course/module indicate the year of study (1st to 4th), whether it is a semester or year course, the number of credits awarded to that module and the total credits for all the courses of that year.

Name of course/module	Year of study (1st, 2nd, 3rd, 4th)	Duration (Year/Semester)	Credit for module	Total credits for all the subjects

6. List the credits for the following courses followed by the students.

Course Name	Year(s) of study	Total credits
Financial Accounting		
Auditing		
Management accounting/ Financial management		
Taxation		
Information technology		
Law		
Other subjects		
TOTAL		

D. IT skills acquired by students

6. Select the IT skills taught at the university from the following list.

Element	***Taught at the university***
Operating Systems	
Word Processing	
Spreadsheets	
Presentation Software	
Internet tools	
Research tools	
Image processing software	
Database software	
Database search and retrieval	
Accounting software	
Tax return preparation software	
Time management and billing systems	
Knowledge work systems (e.g. groupware; workflow systems; expert systems)	
Electronic working papers	
Audit software	
Test data	
Simulation software	
Flow-charting/ data modelling	
Audit modules	
Computer-aided systems engineering tools	
Client/server environment	
Electronic data interchange	
Digital communications	
Network configurations	
Application service providers	
Internet service providers	
Anti-virus software	
Encryption software	
Firewall software/hardware	
User authentication	
Intrusion detection and monitoring	
Back-up and recovery	
Agent technologies	
Data warehousing and data mining	
Programming	

Appendix 2

Appendix 2(a)

Tel: 021-8083437
E-mail: plw@sun.ac.za

Prof ….
The Head of Department

Dear Prof …. ,

The training of IT skills to professional accountants at South African Universities

I am currently enrolled for a PhD study in Accountancy at the University of Stellenbosch with the research topic of **"***The development and evaluation of a framework for the integration of information technology in the training of professional accountants at South African Universities"*. A framework for the critical IT skills required of professional accountants entering the profession in the South African environment has been designed as part of this research. The critical IT skills were identified through an extensive literature review. The South African business environment was analysed to determine the typical organisation and technology that accountants will encounter when they enter the profession. The framework also identified the tools that can be used in teaching the accountant the IT skills necessary to be relevant in the South African business environment.

The purpose of this questionnaire is to determine the availability of resources at South African universities and to evaluate their perspectives on the training of accountants with regard to IT skills in order to devise strategies that can be used by South African Universities to ensure that accountants entering the profession are technologically competent.

The person in your institution that would be able to complete the attached questionnaire is most probably the person responsible for the professional accountancy training programme. The questionnaire can also be distributed to lecturers involved in the training of IT subjects. All returned questionnaires will be dealt with confidentially and the overall analysis only of all the questionnaires will be discussed in the research. Under no circumstances will information be released in a format that allows individuals or individual institutions to be identified.

Your participation in the research project is highly appreciated.

Yours faithfully

Prof PL Wessels
(Researcher)

Prof W Boshoff
(Promotor)

Appendix 2(b)

Dear Prof/Dr/Mr/Me

During the middle of April 2005 I sent your University a letter together with a questionnaire about my research into "*The development and evaluation of a framework for the integration of information technology in the training of professional accountants at South African Universities*". To date I have not received the completed questionnaire from your Institution. To enable me to evaluate the framework against all major role-players in South Africa, it is of vital importance to me that I receive the input from all the SAICA accredited Universities.

I do not know if you did receive a copy, but because you were at the SAICA curriculum meeting, I know that you would be able to complete this questionnaire. I have attached an electronic copy of the questionnaire to this e-mail (in Word format) that can be completed and returned to me by e-mail if this is more convenient. I would appreciate it if the completed questionnaire can be returned to me by not later than 20 June 2005. If this target date is a problem to achieve, please contact me so that we can arrange alternative actions.

Your help in this research project is highly appreciated.

Yours faithfully

Prof Flip Wessels

Appendix 3

Training in IT skills for professional accountants at South African Universities

Questionnaire to academic staff responsible for training of professional accountants at South African Universities

Section A: Background

The reputation, relevance and value of the accountancy and auditing profession depends on the ability of its members to continually meet the expectations of the various stakeholders and to provide a service appropriate to the needs of the specific environment in which they operate. One of the key drivers of change in the environment has been identified as the advances in information and communication technologies. The SAICA syllabus on Information Technology states that '*competence with this technology is imperative for the chartered accountant*' where competence is defined as '*the ability to perform specified tasks to achieve outcomes at the level required for a newly-qualified chartered accountant*'.

A framework for the critical IT skills required of professional accountants entering the profession in the South African environment has been designed as part of a PhD research project. The critical IT skills were identified through an extensive literature review with the use of the International Educational Guideline on Information Technology (IEG 11) that forms part of the International Education Standards issued by IFAC, SAICA's Information Technology syllabus issued in 2003, and other relevant research conducted the last 5 years. The skills that were identified by means of the literature review were correlated with the South African business environment by doing an analysis of the typical South African business and IT environment that accountants will encounter when they enter the profession. This research made it possible to determine that an accountant entering the profession in South Africa will typically be involved with the auditing of or working for a *private company*. The typical South African private company will most likely use a Microsoft *Windows operating system* together with the *Office Suite* of Microsoft (Word, Excel, Powerpoint and Access). The financial transactions will most probably be processed by means of an accounting package like *Pastel* or *Quickbooks* and the Internet will mostly be used for doing electronic banking. The framework was extended to include the **software tools** that can be used in teaching the accountant the IT skills as well as the **level** (from awareness to being a master) of the skill necessary to be relevant in the South African business environment.

The research resulted in the formulation of a set of IT skills and software tools that are required by accountants when they enter the profession to ensure that they are IT competent in a typical South African business environment. The list of critical IT skills is divided into various categories that depict the specific skills that are required by an accountant for performing his/her job, namely the:

- accountant as a user of technology in performing daily business and office tasks;
- accountant conducting assurance testing using technology or evaluating technology (audit automation skills); and
- accountant interacting with new and changing technology as a manager, user and designer of this technology.

The IT skills framework lists the various skills (identified as elements) together with an explanation of what the accountant should be able to do on acquiring that skill (capability). The level of the skill required (being awareness, ability, proficiency or mastery) with a description of the tasks that the accountant should be able to perform (units) and the tools that can be used in teaching these skills are also listed.

IT SKILLS FRAMEWORK				
Accountant as a user of IT: Business Automation Skills				
Element	***Capability***	***Level***	***Units***	***Tools***
Operating Systems	Apply operating systems and utility software in a business/accounting context	Ability	Giving instructions using icons, mouse, pull-down menu Creating and managing folders Copying, deleting & moving folders	Windows Explorer
Word Processing	Apply word processing software in a relevant accounting/business context	Ability	Formatting a report Managing a report Integrating tables/graphs into report Communicating report (e-mail)	MS Word Outlook
Spreadsheets	Apply spreadsheet software in a relevant accounting/ business context	Proficiency	Designing financial spreadsheet models Operating financial spreadsheet models	MS Excel
Presentation Software	Apply presentation software in a relevant accounting/ business context	Ability	Designing a presentation Presenting a presentation	Powerpoint
Internet tools	Apply Internet tools in a relevant accounting/ business context	Ability	Electronic communication and sending file attachments Accessing the Internet	Outlook Internet Explorer
Research tools	Apply professional research tools in a relevant accounting/ business context	Ability	Searching for specific information on the Internet	Search engines (e.g. Google)
Image processing software	Apply image processing software in a relevant accounting/business context	Awareness	Scanning documents Converting documents into text	Scanning software
Accountant as a user of IT: Office Management Skills				
Element	***Capability***	***Level***	***Units***	***Tools***
Database software	Ability to design and use database systems	Proficiency	Designing data tables Entering, deleting, editing records Updating records Changing table structure	MS Excel or MS Access
Database search and retrieval	Ability to search and retrieve data from a database	Proficiency	Importing a database into Excel Sorting the data Using data query tools (filter) Retrieving specific information (filter, lookup) Performing calculations Summarising information according to specific criteria (d-functions, data tables, graphs)	MS Excel
Accounting software	Ability to understand workings of an accounting package	Proficiency	Installation and set-up; Set-up of accounts; Recording transactions; Extracting reports; Periodic processing; Exporting data Programmed controls	Pastel / Quickbooks / Accpac
Tax return preparation software	Ability to use tax return preparation software to capture and record relevant information	Ability	Identifying sources of income and deductions; Calculating tax using tables and schedules; Filing completed return	MS Excel
Time management and billing systems	Ability to use time management and billing	Ability	Capturing information about activity and time	MS Excel

	systems in capturing, managing, billing and reporting time spent on professional duties		Extracting / compiling billing report	
Knowledge work systems (e.g. groupware; workflow systems; expert systems)	Ability to work with knowledge work systems to aid accountants in the creation, integration and communication of knowledge	Ability	Working with groupware in sharing and communicating information among different users.	MS Office
Accountant as a user & evaluator of IT: Audit Automation Skills				
Element	***Capability***	***Level***	***Units***	***Tools***
Electronic working papers	Ability to use software that can generate trial balances and lead schedules for the recording of evidence in the audit	Ability	Developing a spreadsheet model to extract trial balance and financial statements and record adjusting journal entries.	MS Excel
Audit software	Ability to use audit software to access client computer files, extract relevant data and perform audit functions	Ability	Accessing and exporting data files to audit software; Manipulating the data using audit techniques; Performing calculations; Compiling and printing reports	MS Excel
Test data	Ability to generate and use test data to test a computer application	Ability	Generating a set of test data; Entering test data in application program; Compiling working papers; Evaluating results; Using integrated test facility	MS Excel / Pastel
Simulation software	Ability to create simulation modules in order to evaluate the logic of a computer application	Awareness	Creating a simulated version of an aspect of the program Using test data to evaluate the simulation and application	MS Excel / Pastel
Flow-charting/ data modelling	Ability to use software that uses the source code version of an application to produce flow charts of the program logic	Ability	Using software to create flow chart of the logic of an application	MS Excel
Audit modules	Ability to use embedded audit modules (including real-time audit modules) that are incorporated into an application program	Ability	Embedded data collection Tagging Real-time notification Exception reporting	MS Excel / Pastel
Accountant as a manager, evaluator and designer of new technology				
Element	***Capability***	***Level***	***Units***	***Tools***
Computer-aided systems engineering tools	Ability to use computer-aided systems engineering tools in designing new accounting systems or spreadsheet models	Awareness	Creating system documentation consisting of program flow charts, data dictionaries, the testing of a system/model and system and user documentation	MS Office (Word, Excel & Powerpoint)
Client/server environment	Ability to function in a cooperative client/server environment using local area networks	Awareness	Logging onto the network Requesting services from the 'server'	Local LAN
Electronic data interchange	Ability to perform EDI (traditional and web-based) transactions	Awareness	The difference between EDI using private network and web based-XML; Awareness of management and security issues surrounding EDI Electronic Funds Transfer (with banks)	Transactions using Internet (banks, SARS)
Digital communications	Ability to understand digital communications (including wireless communications)	Awareness	Different communication channels re speed (bandwidth, baud rate) and accuracy Wireless communication	E-mail; EDI; Internet
Network configurations	Ability to understand various network configurations (internal & external)	Awareness	Understanding management, usage, security issues in using LAN, WAN, and Internet	Local LAN, Internet

Application service providers	Ability to understand the issues around the management of application service providers	Awareness	Understanding the management and security issues in using application service providers	Use of examples
Internet service providers	Ability to understand the issues around the management of internet service providers	Awareness	Understanding the management and security issues in using Internet service providers.	Local University as ISP
Anti-virus software	Ability to understand the use of anti-virus software to protect computer systems from infections	Awareness	Understanding the importance of installing and maintaining anti-virus software on all systems	
Encryption software	Ability to understand the use of encryption software to change data using some type of encoding/ decoding algorithm	Awareness	Understanding the use of secure sockets overlay technology (SSL) and the use of digital keys for encryption	Visit websites using these technologies
Firewall software/hardware	Ability to understand the use of security technology to enforce an access control policy between networks	Awareness	Understanding the use and management of firewall technology in protecting networks	
User authentication	Ability to understand the use of software and devices to identify system users	Awareness	Using a combination of devices and software to gain access to computer facilities and networks, including physical and logical authentication	Use of the University's computer facilities
Intrusion detection and monitoring	Ability to understand the use of security technology to identify unauthorised requests for services	Awareness	Understanding the use and management of intrusion detection and monitoring software to ensure the proper functioning of a network	
Back-up and recovery	Ability to understand the use of technology for back-up and recovery procedures to ensure continuity of IT services	Awareness	Making back-ups of important files. Recovering data from a back-up file	Microsoft Windows
Agent technologies	Ability to understand the use of programmed modules that are given certain levels of authority and autonomy to act on behalf of a supervisor	Awareness	Using agents in performing certain tasks (Wizards or e-mail filtering agents).	Microsoft Office Outlook
Data warehousing and data mining	Ability to understand the use of data warehousing and extracting trends and patterns using data mining techniques	Awareness	Coping data to one data table in a standardised format Analysing the data using statistical and other functions	Excel

Questionnaire

The purpose of this questionnaire is to determine the opinions of important stakeholders in the education of professional accountants at South African Universities with regard to information and communications technology. It also aims to identify the existing skills and resources available to South African universities. The last part of the questionnaire identifies what needs to be done if this framework was to be implemented at the various Universities including possible barriers and problems envisaged in the implementation. All returned questionnaires will be dealt with confidentially and the overall analysis only of all the questionnaires will be discussed in the research. Under no circumstances will information be released in a format that will allow individuals or individual institutions to be identified.

Your participation in this research project is highly appreciated.

Please answer the following questions, or indicate your preference with a √ or an X where applicable.

Section B – Opinion on the framework
The framework of IT skills and tools required by accountants on entering the profession in South Africa was discussed in section A of this questionnaire that provides background in answering the following questions.

1. Do you agree with the findings of this research on the IT skills and tools that are required by accountants when they enter the profession in South Africa?

YES	
NO	

2. If you answer **NO** to the previous question, is it because you do not agree with:

Guideline IEG11 (issued by IFAC)	
SAICA syllabus on Information Technology	
Analysis of the South African business environment	
Results of other research	
Other (please state reason):	

Section C - Existing skills and resources at your institution
One of the key resources available to an institution is the lecturing staff. The following questions relate to the lecturing staff responsible for the IT training of your students and the time allocated to the study of IT at your Institution.

3. Who are responsible for the teaching of IT-related subjects at your institution?

Accountancy Department/School/Centre	
Information Department in *your* faculty	
Information/Computer Science department in *another* faculty	

4. Are the lecturers responsible for the teaching of the IT component of your accounting programme in possession of a professional accountancy qualification (e.g. CA, CIMA, ACCA)?

YES	
NO	
Some of them	

5. Do you think that the lecturing staff currently employed to teach the IT component, possess the necessary skills/background to reach the objective of ensuring that accountants entering the profession are IT competent as defined in the IT skills framework in section A?

YES	
NO	
Some of them	

6. The SAICA syllabus on Information Technology states that '*the required IT competencies are expected to be developed by reference to the four core syllabi, viz. external financial reporting; auditing, assurance services and corporate governance, managerial accounting and financial management; and taxation*'. Do the lecturers involved in the four core syllabi at your University have the knowledge/ability to be able to integrate relevant IT skills into the course they currently teach?

YES	
NO	
Some of them	

7. During an analysis of the time allocated to the study of IT at various South African Universities, it was determined that on average 10% of total tuition time during the first three years of study is allocated to the study of IT. Most of this tuition time falls in the first two years of study. Do you think that 10% of total tuition time on the study of IT subjects during the first three years of study is adequate, too much or too little? How much do you think is adequate?

		% you think is adequate
Adequate		
Too much		
Too little		

8a. Does your institution offer a separate IT module or integrate IT with the professional subjects in the third year of study?

YES	
NO	

8b. If not, do you think that there is scope during the third year of study to introduce IT skills by integrating it with the four professional subjects or as a separate module?

YES	
NO	

9. Do you think that there is scope during the fourth year of study to introduce IT skills by integrating it with the four professional subjects or as a separate module?

YES	
NO	

10. Does your institution have an IT infrastructure that is adequate for teaching IT skills (as per the IT skills framework in section A) to your students (hardware as well as all the necessary software)?

YES	
NO	

Section D – Implementing the IT skills framework
For the rest of the questionnaire, assume that you are required to implement the IT skills framework at your institution.

11. **What** would you need to do (change) in your institution to implement the IT skills framework?

Make Accountancy department responsible for IT training	
Appoint suitably qualified IT lecturing staff	
Provide additional training to existing IT lecturing staff to enable them to teach the IT skills	
Introduce more IT related subjects/modules in the accounting programme	
Provide additional training to existing lecturers in the four professional subjects to make them more technology literate	
Redesign the accounting programme to allow more time for IT training	
Introduce IT subjects (or integrate IT concepts with the four professional subjects) in the 3rd year of the accounting programme	
Introduce IT subjects (or integrate IT concepts with the four professional subjects) in the 4th year of the accounting programme	
Acquire additional hardware and software	
Other (please specify)	

12. **Who** do you think should be responsible for implementing the IT skills framework to ensure technologically competent accountants enter the profession?

Solely the responsibility of the Universities	
Solely the responsibility of the Auditing Firms or Business organisations	
Should be developed in partnership between Universities and Auditing Firms and Business organisations	
Other (please specify):	

13. If Universities were solely or partially responsible for implementing the IT skills framework, **who** would take responsibility for the implementation of the framework at your Institution?

Head of the Department/Centre/School of Accounting	
Programme co-ordinator for accounting programme	
IT function/department/centre	
Individual lecturers responsible for IT training	
Various subject heads (auditing, financial accounting, etc) where IT is integrated with the subject	
Lecturers involved in professional subject must take responsibility for integrating IT with their subject	
Other (please specify):	

14. **How** would you go about implementing the framework?

Wait for SAICA to give instructions on how to implement the framework	
Appoint a task team to investigate how best to implement an IT skills framework in the Institution	
Head of Department/centre/School would facilitate implementing IT skills framework with other relevant lecturers	
Accounting programme co-ordinator would facilitate implementing IT skills framework with other relevant lecturers	
Each lecturer should decide on how to implement the IT skills framework him/herself	
Implementation of the IT framework is the responsibility of another Department (e.g. Information/Computer Science)	
Other (please specify):	

15. What are the existing **barriers** in your institution that could hamper the implementation of the IT skills framework?

IT component currently taught by Department other than Accountancy department that would make changes to the curriculum difficult to implement	
Lack of suitable staff with IT knowledge in your Institution	
Lack of suitable lecturing staff with accountancy and IT knowledge in the market place	
Scope of SAICA syllabi makes it difficult to allocate more time to IT training	
Lack of capital/money to employ suitably qualified lecturers	
Lack of suitable lecturing material	
Resistance from lecturers to integration of IT with other professional subjects	
The view of lecturers that IT training should be conducted during practical training at auditing firms	
Other (please state)	

Section E – Personal information

16. What is your current position within your institution?

Professor	
Associate professor	
Senior Lecturer	
Lecturer	
Other (specify):	

17. What is your role in the teaching of professional accountants?

Head of Department/School/Centre	
Accounting program co-ordinator	
Responsible for IT training of accountants	
Involved with other subjects than IT	
Other (specify):	

18. If you are willing to supply more information or be of assistance with this research, please provide your contact details (optional).

Name:	
E-mail:	
Telephone:	
Postal address:	
University	

Thank you for your willingness to complete this questionnaire.

Please mail completed questionnaire to:

PL Wessels
Department of Accounting
University of Stellenbosch
Private Bag X1
Matieland, 7602

Electronic versions can be forwarded to:
plw@sun.ac.za

Fax number: 021-8864176